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^{1/} Maintained by the U.S. Department of Agriculture in cooperation with the University of Minnesota.

Preparation of this report was facilitated by workers supplied by the Works Progress Administration and the Civilian Conservation Corps.

Economic Notes No. 10

March 1938

FOREST AREAS AND TIMBER VOLUMES
IN THE LAKE STATES

A Progress Report on the
FOREST SURVEY OF THE LAKE STATES

By

R. N. Cunningham and H. C. Moser

LAKE STATES FOREST EXPERIMENT STATION
University Farm, St. Paul, Minnesota

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

LOCATION OF ECONOMIC UNITS

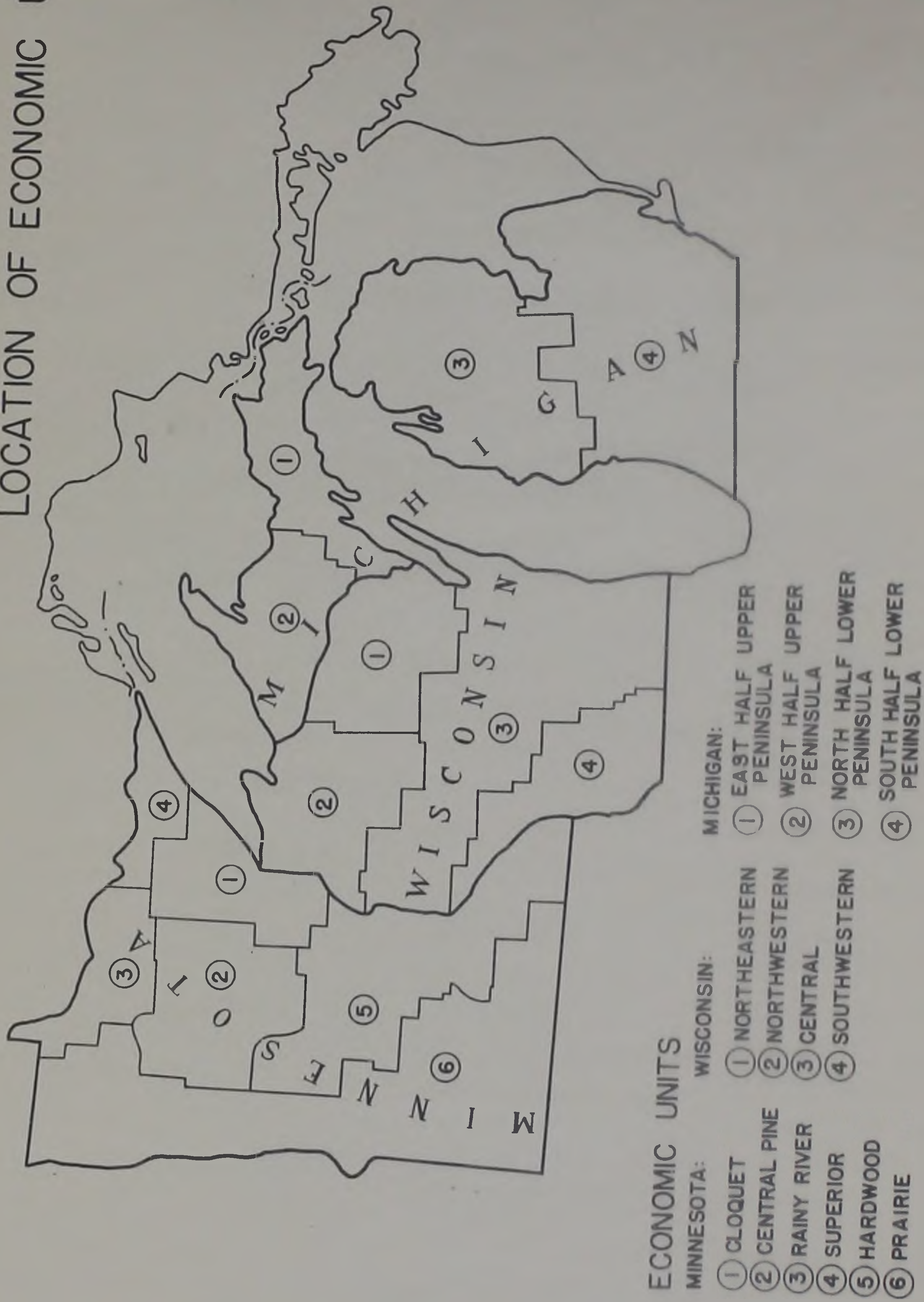


Figure 1

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ECONOMIC NOTES NO. 10

1938

FOREST AREAS AND TIMBER VOLUMES IN THE LAKE STATES

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PRELIMINARY STATISTICS AND ANALYSIS OF DATA OBTAINED FROM
FOREST SURVEYS AND OTHER ECONOMIC STUDIES BY THE

LAKE STATES FOREST EXPERIMENT STATION

UNIVERSITY FARM — ST. PAUL MINNESOTA

U. S. DEPARTMENT OF AGRICULTURE
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FOREST AREAS AND TIMBER VOLUMES

IN THE LAKE STATES

DISCUSSION

The inventory phase of the Forest Survey^{1/} of the Lake States -- Michigan, Minnesota, and Wisconsin -- has been completed, and preliminary statistics obtained through it are summarized in the tables presented in this report. The full significance of these forest-area and timber-volume figures can be determined only after compilation and analysis of statistics on forest-products requirements, timber growth, and forest depletion -- factors which are now engaging the attention of the Survey staff. These tables do, however, bring out a number of very significant points.

^{1/} The Forest Survey is a Nation-wide project authorized by Act of Congress (the McNary-McSweeney Forest Research Act) in 1928. The purpose is to obtain reliable statistics of forest area, timber volumes, growth, rate of depletion, and trends in timber consumption and requirements as a basis for determination of national policies. The inventory of forest areas and timber volumes in the Lake States is based upon a survey in which lines were run 10 miles apart throughout the forested areas of the three States and sample plots were taken at 1/8-mile intervals along each line. More than 120,000 plots were measured. This is the first complete field inventory of forest resources attempted in the Lake States.

The growing stock in the Lake States is badly depleted. There is too little mature timber, too little advanced second growth, to insure sustained production of high-grade wood in the near future.

There is, however, a large volume of wood of inferior quality and inferior species available for immediate use if the necessary processes and markets can be developed.

Nature has done a better job than many people suppose in restoring a cover on cut-over lands. The outlook for the more distant future is not nearly so black as it has usually been painted, provided there are continued improvements in fire protection and measures are taken to safeguard the young stands from premature cutting and other forms of abuse.

The major immediate forest problem of the Lake States is how to handle the remaining merchantable timber so as to tide over industries until second-growth forests develop to suitable size for cutting.

In general, the tables and charts speak for themselves. Attention will be called, however, to some of their outstanding indications; also, as a basis for orientation, attention will be called to

points on which the present statistics differ from earlier estimates^{2/} or on which the new data seem to contradict views commonly held.

The figures on forest area will be useful chiefly in considering the long-run possibilities of the Lake States forests; the volume figures will be used chiefly in figuring prospects for industries in the near future.

Before using data from this release, it is suggested that the reader familiarize himself with the several bases of classification and the standards of estimate used in the field work of the Forest Survey. These are described in some detail in the section following the tables. The methods followed in carrying on the survey are described in Economic Notes No. 4, released in May, 1936.

Forest Areas

Table 1 shows that the pine, spruce, and hardwood forests which originally occupied about 80 percent of all land in the three States now cover only 55.6 million acres, or 45.4 percent of

^{2/} The most recent of the previous estimates is the one made by the U.S. Forest Service in 1931, which served as the basis of the "Copeland Report." The 1931 figures were based upon maps and rough reconnaissance data.

the land. Forest acreage now totals 7 percent less than was estimated in 1931, the difference probably being due to inadequacy of the earlier figures.

The present forest acreage in the Lake States is almost identical with the productive forest area of Sweden and also with that of Finland. Swedish forests, however, occupy 56.5 percent of the national total land area, and those of Finland 67.2 percent. Forest lands average about 5.4 acres per capita in the Lake States, as compared with 9.39 acres in Sweden and 15.81 acres in Finland.^{3/}

Timber large enough to make sawlogs, as is shown in table 2, occupies 7 million acres, or 40 percent more than the 1931 estimate. There is 85 percent more pine saw timber than was previously listed. Cordwood acreage, also, is 20 percent greater. The shrinkage comes mainly in the total for the aspen type, which has been reduced 5 million acres below the 1931 estimate. However, aspen (with paper birch) is still the leading individual type, with 16-2/3 million acres, or 30 percent of the total forest area. The change in the aspen-type appraisal, which involves an increase of nearly 250 percent in saw-timber acreage and one of nearly 200 percent in cordwood acreage over 1931 figures, and greatly reduces

^{3/} Ilvessalo, Yrjo. A Comparison of the Forest Resources of the Northern Countries. Helsinki, 1931.

the acreage of restocking land, may merely reflect the inadequacy of earlier statistics but may indicate a gradual development in the condition of aspen-type stands.

The deforested acreage is greater than was estimated in 1931 -- 11-1/4 million acres as compared with 7 million. It is much less, however, than the figure given in the Capper Report in 1919 -- 20-1/2 million acres.

Acreage of deforested land is sometimes spoken of as synonymous with acreage needing planting. Some details which will qualify this assumption are given in tables 19 and 20. About 22 percent of the 11-1/4 million deforested acres consists of pastured lands on farms where, under existing plans of farm management, forest plantations would have little chance of success. Another 5.7 million acres of wild land, covered with dense brush or marsh grasses, would be very difficult to reforest. Level, easily plantable land totals only about 3 million acres.

On the other hand, half of the 26-1/2 million acres of restocking lands have been classified as of poor density (table 4). Doubtless many of these would require underplanting to become fully productive forests.

Tables 5 to 20, inclusive, give details concerning forest areas for each of the States, and for economic units within the

States. These will be of value mainly to those interested in particular local conditions. They bring out important differences between the States and between the farm-woods districts and the less accessible northern forests. The economic unit with the greatest acreage of uncut saw timber embraces the western half of the Upper Peninsula of Michigan. The northern half of the Lower Peninsula has the greatest acreage of deforested land.

In the distribution of forest areas as to size class of stand technical foresters will recognize evidences of an unbalanced growing stock -- an excess of very young timber with a corresponding shortage of stands of merchantable or near-merchantable size. This is most pronounced in the economic units closest to the consuming centers.

Saw-Timber Volume

The volume of standing saw timber shown in table 23 is 60 percent greater than estimates which were in use until the completion of this survey. The estimate for hemlock has been doubled, that for yellow birch increased 150 percent, those for jack pine and white pine about 170 percent, and that for aspen over 360 percent. The older estimates for maple and oak proved to be fairly close.

While these increases are encouraging, it must be recognized that present volumes are indeed a small fraction of the stands originally found in the Lake States and are considerably below what would be considered a desirable growing stock. The original stand of pine in the Lake States has been estimated at 300 to 350 billion board feet, or about 40 times the volume now remaining. No reliable estimate has been made of the original volume of hemlock and hardwood, but it is not unlikely that the total exceeded 100 billion feet, about 3 times the present volume.

There are certain indications, also, that the present stands are inferior in quality to the original forests. As regards species there is no absolute basis of comparison, but it is certain that there was a much smaller proportion of jack pine in the original pine forests. The new hardwood estimates show a greater proportion of such species as aspen, red maple, black ash, and elm than was shown by the estimates of 25 years ago.

As regards size of trees, table 25 shows that 28 percent of the saw-timber volume is in trees not more than 13 inches in diameter. Only 41.6 billion board feet of saw timber is in trees above this diameter. In Minnesota, 45 percent of the volume is in the small-sized timber.

Table 26 brings out another limiting factor: one-fifth of the saw-timber volume occurs on cordwood or restocking areas. By referring to table 34, it will be seen that the average cordwood acre supports a saw-timber volume of only 671 board feet, and an average restocking acre has only 111 board feet. Obviously, such a sparse stand does not present a very favorable logging chance. Even the typical second-growth saw-timber stand has a relatively low merchantable volume -- not quite 4 thousand board feet per acre.

Table 32 gives a clue to the average quality of the hardwood saw timber in each of the States. For the region as a whole, only 22 percent of the volume falls into the class of veneer logs and high-grade sawlogs and 30 percent falls into the No. 3 grade, the lowest quality acceptable in the lumber industry and one which in periods of low prices may be left in the woods.

Tables 37 to 56, inclusive, give details for States and subdivisions.

Pulpwood Volume

Table 27 shows that the region contains 128,586,000 cords of wood 4 inches or more in diameter in the common pulping species. Exclusive of sawlogs, wood suitable for high-grade pulpwood totals 39,440,000 cords (table 28).

In comparison with the 1931 estimates the figure for spruce is down 15 percent, the reduction being heaviest in Wisconsin. Wisconsin, which has the largest pulp industry of the three States, now has only 7 percent of the spruce pulpwood volume. The jack pine pulpwood estimate has been reduced 47 percent, the loss being heaviest in Michigan. The aspen pulpwood estimate has been raised 29 percent, the balsam fir 52 percent, and the hemlock nearly eight-fold. The tamarack total is little changed.

It must be understood, of course, that not all the volume classified as pulpwood is available for immediate conversion into pulp. A part must be retained as growing stock to provide future saw timber.

Cedar Products

The number of cedar poles and posts as shown in table 30 is much larger than is commonly supposed. However, the small extent and inaccessibility of certain stands place limits on their availability for immediate use.

Total Cubic Volume

The total cubic volume shown in table 31 is roughly half the volume found in Sweden in the survey which was made there a few years ago. The acreage of forest in Sweden is almost identical with that in the three Lake States combined. The per-acre volume in Sweden is about 847 cubic feet, in the Lake States 464 cubic feet (table 34). The standards of measurement are not identical, but are sufficiently close for comparative purposes. Finland's forests, likewise, average about 837 cubic feet per acre. The forests of Norway, occupying more rugged land, average but 589 cubic feet per acre. Thus the forest growing stock in the Lake States is low in comparison with that in northwestern Europe.

On a per-capita basis, there is only about one-fourth as much standing volume in the Lake States as in Sweden and only about one-sixth as much as in Finland.

Table 1. -- Area of forest land in the Lake States Region, by State and unit

| State and unit | Gross land area <u>1/</u> | Area in forest | |
|---------------------|------------------------------|----------------|----------------|
| | | <u>Acres</u> | <u>Percent</u> |
| Minnesota | | | |
| 1..... | 5,369,400 | 4,329,900 | 80.64 |
| 2..... | 7,206,000 | 5,284,900 | 73.34 |
| 3..... | 4,141,100 | 3,808,400 | 91.97 |
| 4..... | 2,101,300 | 2,030,700 | 96.64 |
| 5..... | 11,356,300 | 2,318,300 | 20.41 |
| 6..... | 20,851,900 | 1,843,200 | 8.84 |
| Total..... | 51,026,000 | 19,615,400 | 38.44 |
| Wisconsin | | | |
| 1..... | 5,750,000 | 4,567,000 | 79.43 |
| 2..... | 6,933,000 | 5,683,000 | 81.97 |
| 3..... | 16,475,000 | 4,869,000 | 29.55 |
| 4..... | 5,969,000 | 1,827,000 | 30.61 |
| Total..... | 35,127,000 | 16,946,000 | 48.24 |
| Michigan | | | |
| 1..... | 5,000,000 | 4,350,000 | 87.00 |
| 2..... | 5,571,000 | 4,986,000 | 89.50 |
| 3..... | 10,774,000 | 7,441,000 | 69.06 |
| 4..... | 15,055,000 | 2,296,000 | 15.25 |
| Total..... | 36,400,000 | 19,073,000 | 52.40 |
| Regional total..... | 122,553,000 | 55,634,400 | 45.40 |

1/ Data obtained from surveys of the United States General Land Office.

Table 2. -- Area of forest land in the Lake States Region, by forest cover type and size class

| Forest cover type <u>1/</u> | Size class of stand | | | | |
|-----------------------------|---------------------|-----------------------|--------------------------|--------------|-----------------|
| | All sizes | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| White pine..... | 619,700 | 231,000 | 107,200 | 188,300 | 93,200 |
| Red pine..... | 339,500 | 43,600 | 75,200 | 134,700 | 86,000 |
| Jack pine..... | 2,706,000 | 4,400 | 322,100 | 929,800 | 1,449,700 |
| Spruce-fir..... | 3,147,300 | 76,000 | 328,700 | 1,186,300 | 1,556,300 |
| Spruce swamp... | 2,332,800 | 3,000 | 44,900 | 818,100 | 1,466,800 |
| Tamarack swamp. | 1,106,900 | 3,000 | 16,300 | 241,500 | 846,100 |
| Cedar swamp.... | 1,220,600 | 21,600 | 87,300 | 415,100 | 696,600 |
| Nonproductive swamp..... | 836,100 | ..... | ..... | 6,400 | 829,700 |
| Northern hard-woods..... | 8,214,600 | 2,579,100 | 1,190,300 | 1,277,600 | 3,167,600 |
| Oak..... | 3,519,000 | 303,800 | 559,300 | 1,232,300 | 1,423,600 |
| Ash-elm..... | 1,973,100 | 222,300 | 292,300 | 732,700 | 725,800 |
| Aspen-birch.... | 16,671,800 | 49,300 | 506,800 | 3,251,500 | 12,864,200 |
| Scrub forest... | 1,702,900 | 49,000 | 7,000 | 422,600 | 1,224,300 |
| Deforested..... | 11,244,100 | | | | |
| All forest types..... | 55,634,400 | 3,586,100 | 3,537,400 | 10,836,900 | 26,429,900 |
| Shelterbelts <u>2/</u> | 86,300 | 1,300 | 14,400 | 50,600 | 20,000 |

1/ Scrub oak forest in the northern half of the Lower Peninsula of Michigan is included with the oak type.

2/ Includes shelterbelts in prairie region of Minnesota only. Data excluded from regional total because of noncommercial character of shelterbelts.

FOREST LAND BY COVER TYPES AND SIZE CLASSES LAKE STATES REGION

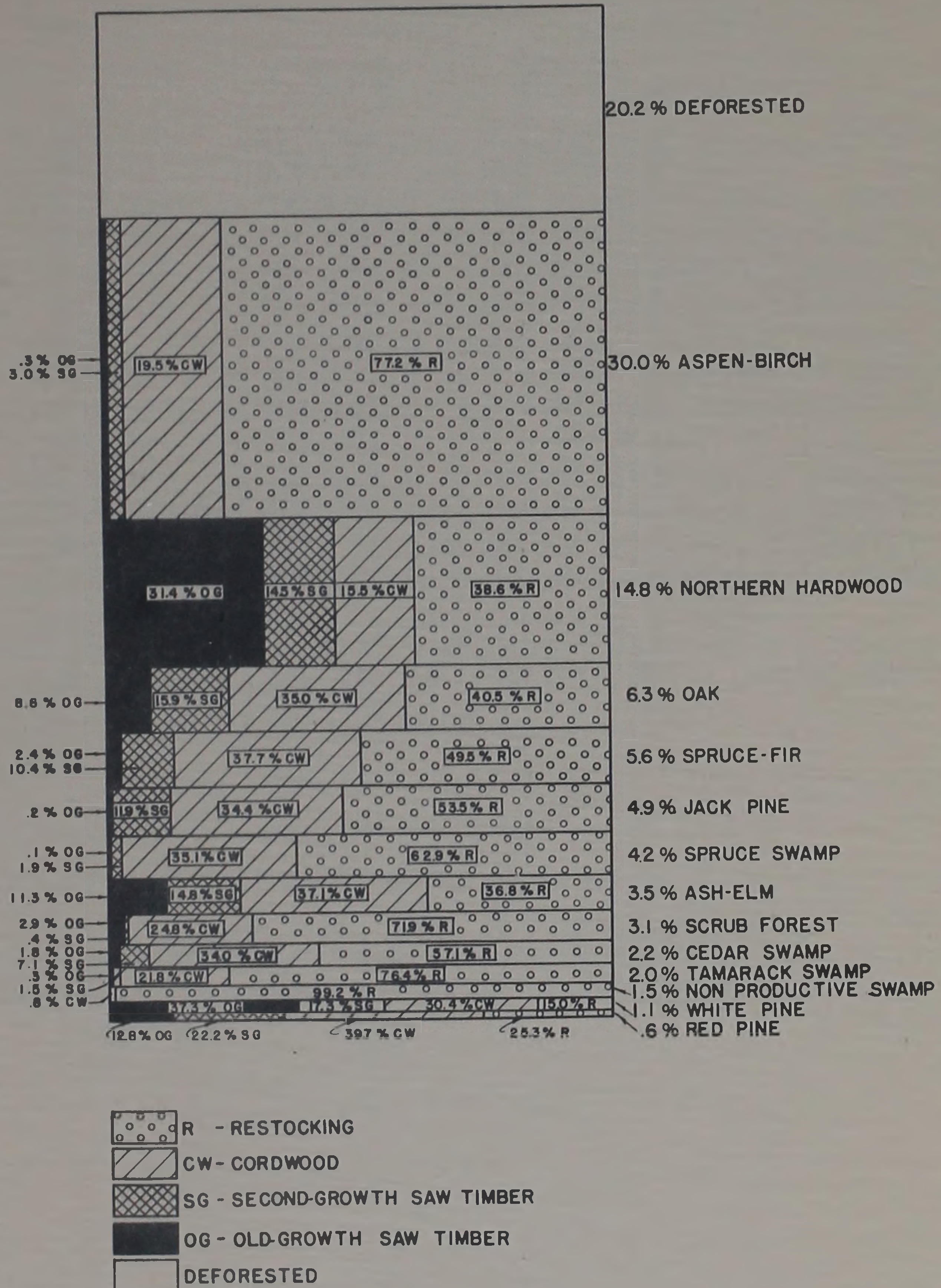


Figure 2

Table 3. -- Area of forest land in the Lake States Region, by forest cover type and State

| Forest cover type | Region | Minnesota | Wisconsin | Michigan |
|----------------------------------|--------------|--------------|--------------|---------------------|
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| White pine..... | 619,700 | 233,700 | 215,000 | 171,000 |
| Red pine..... | 339,500 | 170,500 | 86,000 | 83,000 |
| Jack pine..... | 2,706,000 | 1,266,000 | 665,000 | 775,000 |
| Spruce-fir..... | 3,147,300 | 1,088,300 | 638,000 | 1,421,000 |
| Spruce swamp..... | 2,332,800 | 1,529,800 | 325,000 | 478,000 |
| Tamarack swamp..... | 1,106,900 | 656,900 | 203,000 | 247,000 |
| Cedar swamp..... | 1,220,600 | 380,600 | 201,000 | 639,000 |
| Nonproductive swamp.. | 836,100 | 763,100 | 50,000 | 23,000 |
| Northern hardwoods... | 8,214,600 | 893,600 | 2,745,000 | 4,576,000 |
| Oak..... | 3,519,000 | 476,000 | 1,736,000 | <u>1/</u> 1,307,000 |
| Ash-elm..... | 1,973,100 | 616,100 | 674,000 | 683,000 |
| Aspen-birch..... | 16,671,800 | 6,309,800 | 5,317,000 | 5,045,000 |
| Scrub forest..... | 1,702,900 | 1,107,900 | 552,000 | <u>1/</u> 43,000 |
| Deforested..... | 11,244,100 | 4,123,100 | 3,539,000 | 3,582,000 |
| All forest types..... | 55,634,400 | 19,615,400 | 16,946,000 | 19,073,000 |
| Shelterbelts ^{2/} | 86,300 | 86,300 | | |

^{1/} Scrub oak forest in the northern half of the Lower Peninsula is included with the oak type.

^{2/} Includes shelterbelts in prairie region of Minnesota only. Data excluded from regional total because of noncommercial character of shelterbelts.

Table 4. -- Density of cover on restocking lands in the Lake States Region,
by forest cover type and State

| Forest cover type | Percentage of area in indicated density class ^{1/} | | | | | | | | | | | |
|--|---|------|------|-----------|------|------|-----------|------|------|----------|------|------|
| | Region | | | Minnesota | | | Wisconsin | | | Michigan | | |
| | G | M | P | G | M | P | G | M | P | G | M | P |
| Black pine.. | 13.5 | 28.4 | 58.1 | 18.5 | 29.1 | 52.4 | 17.3 | 32.3 | 50.4 | 7.8 | 25.0 | 67.2 |
| Red pine... | 17.0 | 22.9 | 60.1 | 33.1 | 22.3 | 44.6 | 7.4 | 37.0 | 55.6 | 10.3 | 10.4 | 79.3 |
| White pine. | 17.2 | 31.7 | 51.1 | 33.3 | 16.9 | 49.8 | 9.5 | 40.5 | 50.0 | 17.8 | 28.6 | 53.6 |
| Jack..... | 17.3 | 23.8 | 58.9 | 5.2 | 31.6 | 63.2 | 30.3 | 25.1 | 44.6 | 9.8 | 22.1 | 68.1 |
| Crab oak.. | 11.6 | 28.1 | 60.3 | 1.4 | 22.8 | 75.8 | 17.1 | 31.4 | 51.5 | 3.3 | 16.7 | 80.0 |
| Aspen..... | 17.3 | 31.5 | 51.2 | 16.9 | 32.5 | 50.6 | 20.6 | 34.8 | 44.6 | 14.0 | 27.0 | 59.0 |
| Balsam fir. | 21.7 | 29.4 | 48.9 | 14.5 | 30.0 | 55.5 | 14.0 | 33.6 | 52.4 | 30.2 | 26.6 | 43.2 |
| Northern hardwoods. | 29.8 | 28.9 | 41.3 | 8.9 | 29.2 | 61.9 | 27.8 | 33.6 | 38.6 | 35.1 | 25.9 | 39.0 |
| Spruce..... | 24.8 | 37.8 | 37.4 | 24.6 | 38.0 | 37.4 | 26.9 | 43.3 | 29.8 | 23.4 | 32.6 | 44.0 |
| Amarack... | 28.6 | 27.8 | 43.6 | 31.4 | 26.8 | 41.8 | 24.9 | 30.4 | 44.7 | 24.7 | 28.0 | 47.3 |
| Cedar..... | 41.6 | 29.0 | 29.4 | 23.5 | 37.9 | 38.6 | 54.7 | 23.6 | 21.7 | 45.3 | 26.9 | 27.8 |
| Nonproduc- tive swamp bottomland | 32.7 | 38.7 | 28.6 | 34.6 | 39.9 | 25.5 | 22.0 | 30.0 | 48.0 | 8.7 | 26.1 | 65.2 |
| Hardwoods. | 10.9 | 23.5 | 65.6 | 9.4 | 24.3 | 66.3 | 10.5 | 28.3 | 61.2 | 13.6 | 17.1 | 69.3 |
| All forest types..... | 20.4 | 30.4 | 49.2 | 18.8 | 32.2 | 49.0 | 21.9 | 33.5 | 44.6 | 20.5 | 26.1 | 53.4 |

G = Good density -- 700 or more trees per acre, well distributed.
M = Medium density -- 400 to 700 trees per acre, well distributed.
P = Poor density -- 100 to 400 trees per acre, well distributed.

Table 5. -- Area of all forest cover types in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | | Deforested land |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land | |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota | | | | | | |
| 1..... | 4,329,900 | 23,600 | 135,200 | 575,800 | 2,454,400 | 1,140,900 |
| 2..... | 5,284,900 | 66,600 | 373,000 | 1,132,500 | 2,822,000 | 890,800 |
| 3..... | 3,808,400 | 80,800 | 189,400 | 851,500 | 1,791,500 | 895,200 |
| 4..... | 2,030,700 | 33,600 | 303,900 | 938,700 | 675,300 | 79,200 |
| 5..... | 2,318,300 | 104,100 | 160,200 | 679,500 | 683,900 | 690,600 |
| 6..... | 1,843,200 | 34,400 | 61,700 | 380,900 | 939,800 | 426,400 |
| Total. | 19,615,400 | 343,100 | 1,223,400 | 4,558,900 | 9,366,900 | 4,123,100 |
| Wisconsin | | | | | | |
| 1..... | 4,567,000 | 355,000 | 231,000 | 634,000 | 2,575,000 | 772,000 |
| 2..... | 5,683,000 | 240,000 | 217,000 | 1,015,000 | 3,206,000 | 1,005,000 |
| 3..... | 4,869,000 | 393,000 | 357,000 | 832,000 | 2,027,000 | 1,260,000 |
| 4..... | 1,827,000 | 257,000 | 356,000 | 393,000 | 319,000 | 502,000 |
| Total. | 16,946,000 | 1,245,000 | 1,161,000 | 2,874,000 | 8,127,000 | 3,539,000 |
| Michigan | | | | | | |
| 1..... | 4,350,000 | 565,000 | 251,000 | 875,000 | 2,059,000 | 600,000 |
| 2..... | 4,986,000 | 1,093,000 | 503,000 | 852,000 | 1,934,000 | 604,000 |
| 3..... | 7,441,000 | 88,000 | 162,000 | 1,256,000 | 4,356,000 | 1,579,000 |
| 4..... | 2,296,000 | 252,000 | 237,000 | 421,000 | 587,000 | 799,000 |
| Total. | 19,073,000 | 1,998,000 | 1,153,000 | 3,404,000 | 8,936,000 | 3,582,000 |
| Regional total.... | 55,634,400 | 3,586,100 | 3,537,400 | 10,836,900 | 26,429,900 | 11,244,100 |
| Shelter-belts 1/. | 86,300 | 1,300 | 14,400 | 50,600 | 20,000 | ..... |

1/ Includes shelterbelts in prairie region of Minnesota only. Data excluded from regional total because of noncommercial character of shelterbelts.

Table 6. -- Area of white pine type in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 15,700 | 2,400 | ^{1/} | 7,800 | 5,500 |
| 2..... | 62,100 | 30,300 | 12,300 | 11,700 | 7,800 |
| 3..... | 49,300 | 38,900 | ^{1/} | 9,600 | 800 |
| 4..... | 97,800 | 33,600 | ^{1/} | 61,000 | 3,200 |
| 5..... | 7,200 | 800 | 800 | 800 | 4,800 |
| 6..... | 1,600 | ..... | 100 | 400 | 1,100 |
| Total..... | 233,700 | 106,000 | 13,200 | 91,300 | 23,200 |
| Wisconsin: | | | | | |
| 1..... | 82,000 | 25,000 | 24,000 | 13,000 | 20,000 |
| 2..... | 55,000 | 14,000 | 8,000 | 20,000 | 13,000 |
| 3..... | 73,000 | 34,000 | 19,000 | 11,000 | 9,000 |
| 4..... | 5,000 | 1,000 | 3,000 | 1,000 | ..... |
| Total..... | 215,000 | 74,000 | 54,000 | 45,000 | 42,000 |
| Michigan: | | | | | |
| 1..... | 45,000 | 15,000 | 6,000 | 14,000 | 10,000 |
| 2..... | 75,000 | 28,000 | 22,000 | 18,000 | 7,000 |
| 3..... | 40,000 | 7,000 | 8,000 | 15,000 | 10,000 |
| 4..... | 11,000 | 1,000 | 4,000 | 5,000 | 1,000 |
| Total..... | 171,000 | 51,000 | 40,000 | 52,000 | 28,000 |
| Regional total... | 619,700 | 231,000 | 107,200 | 188,300 | 93,200 |

^{1/} Small acreage included with old-growth saw timber.

Table 7. -- Area of red pine type in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 16,400 | 800 | ..... | 11,700 | 3,900 |
| 2..... | 90,100 | 13,900 | 20,100 | 37,800 | 18,300 |
| 3..... | 37,100 | 12,100 | 9,700 | 12,100 | 3,200 |
| 4..... | 17,800 | ¹ | 2,600 | 13,500 | 1,700 |
| 5..... | 7,200 | 800 | 1,600 | 2,400 | 2,400 |
| 6..... | 1,900 | ..... | 200 | 1,200 | 500 |
| Total..... | 170,500 | 27,600 | 34,200 | 78,700 | 30,000 |
| Wisconsin: | | | | | |
| 1..... | 49,000 | 7,000 | 14,000 | 9,000 | 19,000 |
| 2..... | 23,000 | 1,000 | 6,000 | 12,000 | 4,000 |
| 3..... | 11,000 | 2,000 | 3,000 | 2,000 | 4,000 |
| 4..... | 8,000 | ..... | 1,000 | 2,000 | ..... |
| Total..... | 86,000 | 10,000 | 24,000 | 25,000 | 27,000 |
| Michigan: | | | | | |
| 1..... | 37,000 | 2,000 | 5,000 | 20,000 | 10,000 |
| 2..... | 13,000 | 1,000 | 6,000 | 4,000 | 2,000 |
| 3..... | 33,000 | 3,000 | 6,000 | 7,000 | 17,000 |
| 4..... | ..... | ..... | ..... | ..... | ..... |
| Total..... | 83,000 | 6,000 | 17,000 | 31,000 | 29,000 |
| Regional total.. | 339,500 | 43,600 | 75,200 | 134,700 | 86,000 |

¹/ Included with second-growth saw timber.

Table 8. -- Area of jack pine type in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 121,500 | ..... | 19,700 | 61,100 | 40,700 |
| 2..... | 480,800 | 2,400 | 59,400 | 200,400 | 218,600 |
| 3..... | 100,400 | ..... | 14,600 | 61,600 | 24,200 |
| 4..... | 554,800 | ..... | 184,500 | 196,100 | 174,200 |
| 5..... | 6,400 | ..... | 1,600 | 2,400 | 2,400 |
| 6..... | 2,100 | ..... | 300 | 1,200 | 600 |
| Total..... | 1,266,000 | 2,400 | 280,100 | 522,800 | 460,700 |
| Wisconsin: | | | | | |
| 1..... | 83,000 | 1,000 | 7,000 | 21,000 | 54,000 |
| 2..... | 264,000 | ..... | 10,000 | 77,000 | 177,000 |
| 3..... | 299,000 | 1,000 | 8,000 | 93,000 | 197,000 |
| 4..... | 19,000 | ..... | ..... | 7,000 | 12,000 |
| Total..... | 665,000 | 2,000 | 25,000 | 198,000 | 440,000 |
| Michigan: | | | | | |
| 1..... | 190,000 | ..... | ..... | 48,000 | 142,000 |
| 2..... | 43,000 | ..... | 2,000 | 13,000 | 28,000 |
| 3..... | 530,000 | ..... | 15,000 | 144,000 | 371,000 |
| 4..... | 12,000 | ..... | ..... | 4,000 | 8,000 |
| Total..... | 775,000 | ..... | 17,000 | 209,000 | 549,000 |
| Regional total. | 2,706,000 | 4,400 | 322,100 | 929,800 | 1,449,700 |

Table 9. -- Area of spruce-fir type in the Lake States Region, by States, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 426,100 | 6,300 | 33,800 | 149,800 | 236,200 |
| 2..... | 243,900 | 6,900 | 44,000 | 116,600 | 76,400 |
| 3..... | 295,600 | 10,500 | 44,500 | 141,100 | 99,500 |
| 4..... | 108,700 | ..... | 7,100 | 81,400 | 20,200 |
| 5..... | 4,000 | ..... | 800 | 1,600 | 1,600 |
| 6..... | 10,000 | 300 | 1,500 | 4,800 | 3,400 |
| Total..... | 1,088,300 | 24,000 | 131,700 | 495,300 | 437,300 |
| Wisconsin: | | | | | |
| 1..... | 299,000 | 2,000 | 6,000 | 85,000 | 206,000 |
| 2..... | 296,000 | 1,000 | 12,000 | 113,000 | 170,000 |
| 3..... | 43,000 | ..... | 2,000 | 16,000 | 25,000 |
| 4..... | ..... | ..... | ..... | ..... | ..... |
| Total..... | 638,000 | 3,000 | 20,000 | 214,000 | 401,000 |
| Michigan: | | | | | |
| 1..... | 623,000 | 15,000 | 55,000 | 242,000 | 311,000 |
| 2..... | 512,000 | 33,000 | 112,000 | 162,000 | 205,000 |
| 3..... | 285,000 | 1,000 | 10,000 | 73,000 | 201,000 |
| 4..... | 1,000 | ..... | ..... | ..... | 1,000 |
| Total..... | 1,421,000 | 49,000 | 177,000 | 477,000 | 718,000 |
| Regional total | 3,147,300 | 76,000 | 328,700 | 1,186,300 | 1,556,300 |

Table 10. -- Area of northern hardwood type^{1/} in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 82,500 | 10,200 | 14,200 | 13,300 | 44,800 |
| 2..... | 302,300 | 6,100 | 64,900 | 56,400 | 174,900 |
| 3..... | 14,400 | 1,600 | 3,200 | 3,200 | 6,400 |
| 4..... | 2,200 | ..... | 1,900 | 200 | 100 |
| 5..... | 393,500 | 70,500 | 74,500 | 140,300 | 108,200 |
| 6..... | 98,700 | 17,700 | 18,600 | 35,200 | 27,200 |
| Total..... | 893,600 | 106,100 | 177,300 | 248,600 | 361,600 |
| Wisconsin: | | | | | |
| 1..... | 975,000 | 297,000 | 122,000 | 95,000 | 461,000 |
| 2..... | 968,000 | 206,000 | 139,000 | 164,000 | 459,000 |
| 3..... | 588,000 | 186,000 | 146,000 | 123,000 | 133,000 |
| 4..... | 214,000 | 82,000 | 49,000 | 38,000 | 45,000 |
| Total..... | 2,745,000 | 771,000 | 456,000 | 420,000 | 1,098,000 |
| Michigan: | | | | | |
| 1..... | 1,121,000 | 504,000 | 110,000 | 96,000 | 411,000 |
| 2..... | 2,101,000 | 1,006,000 | 258,000 | 218,000 | 619,000 |
| 3..... | 987,000 | 68,000 | 95,000 | 209,000 | 615,000 |
| 4..... | 367,000 | 124,000 | 94,000 | 86,000 | 63,000 |
| Total..... | 4,576,000 | 1,702,000 | 557,000 | 609,000 | 1,708,000 |
| Regional total.. | 8,214,600 | 2,579,100 | 1,190,300 | 1,277,600 | 3,167,600 |

^{1/}Including oak in upper Michigan and ash-elm in Minnesota, Unit 4.

Table 11. -- Area of oak type^{1/} in the Lake States Region, by State,
economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|----------------------------|---------------|--------------------------|-----------------------------|--------------|--------------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 5,600 | ..... | 800 | ..... | 4,800 |
| 2..... | 37,400 | 2,300 | 3,100 | 11,600 | 20,400 |
| 3..... | ..... | ..... | ..... | ..... | ..... |
| 4..... | ..... | ..... | ..... | ..... | ..... |
| 5..... | 274,000 | 16,800 | 49,700 | 156,300 | 51,200 |
| 6..... | 159,000 | 9,700 | 28,700 | 90,400 | 30,200 |
| Total..... | 476,000 | 28,800 | 82,300 | 258,300 | 106,600 |
| Wisconsin: | | | | | |
| 1..... | 97,000 | 5,000 | 4,000 | 11,000 | 77,000 |
| 2..... | 84,000 | 4,000 | 3,000 | 19,000 | 58,000 |
| 3..... | 707,000 | 84,000 | 111,000 | 277,000 | 235,000 |
| 4..... | 848,000 | 121,000 | 274,000 | 298,000 | 155,000 |
| Total..... | 1,736,000 | 214,000 | 392,000 | 605,000 | 525,000 |
| Michigan: | | | | | |
| 1..... | ..... | ..... | ..... | ..... | ..... |
| 2..... | ..... | ..... | ..... | ..... | ..... |
| 3..... | 872,000 | 1,000 | 2,000 | 229,000 | 640,000 |
| 4..... | 435,000 | 60,000 | 83,000 | 140,000 | 152,000 |
| Total..... | 1,307,000 | 61,000 | 85,000 | 369,000 | 792,000 |
| Regional total.. | 3,519,000 | 303,800 | 559,300 | 1,232,300 | 1,423,600 |

^{1/}Including scrub oak in Michigan unit 3. Oak in upper Michigan is included not here but with northern hardwoods, in table 10.

Table 12. -- Area of ash-elm type^{1/} in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 116,900 | 800 | 10,200 | 27,500 | 78,400 |
| 2..... | 199,300 | 800 | 29,400 | 71,800 | 97,300 |
| 3..... | 73,700 | 5,600 | 8,900 | 26,700 | 32,500 |
| 4..... | ..... | ..... | ..... | ..... | ..... |
| 5..... | 153,000 | 13,600 | 21,600 | 50,500 | 67,300 |
| 6..... | 73,200 | 6,500 | 10,200 | 24,200 | 32,300 |
| Total..... | 616,100 | 27,300 | 80,300 | 200,700 | 307,800 |
| Wisconsin: | | | | | |
| 1..... | 124,000 | 11,000 | 27,000 | 46,000 | 40,000 |
| 2..... | 185,000 | 10,000 | 19,000 | 72,000 | 84,000 |
| 3..... | 288,000 | 60,000 | 50,000 | 106,000 | 72,000 |
| 4..... | 77,000 | 21,000 | 9,000 | 24,000 | 23,000 |
| Total..... | 674,000 | 102,000 | 105,000 | 248,000 | 219,000 |
| Michigan: | | | | | |
| 1..... | 87,000 | 9,000 | 10,000 | 31,000 | 37,000 |
| 2..... | 113,000 | 14,000 | 29,000 | 37,000 | 33,000 |
| 3..... | 187,000 | 7,000 | 15,000 | 95,000 | 70,000 |
| 4..... | 296,000 | 63,000 | 53,000 | 121,000 | 59,000 |
| Total..... | 683,000 | 93,000 | 107,000 | 284,000 | 199,000 |
| Regional total.. | 1,973,100 | 222,300 | 292,300 | 732,700 | 725,800 |

^{1/} Ash-elm type in Minnesota Unit 4 included with northern hardwoods, in table 10.

Table 13. -- Area of spruce swamp type in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 353,300 | ..... | 1,600 | 44,000 | 307,700 |
| 2..... | 221,500 | ..... | ..... | 67,200 | 154,300 |
| 3..... | 468,200 | ..... | 9,700 | 260,000 | 198,500 |
| 4..... | 439,400 | ..... | 6,800 | 222,400 | 210,200 |
| 5..... | 7,200 | ..... | ..... | 3,200 | 4,000 |
| 6..... | 40,200 | ..... | 800 | 22,300 | 17,100 |
| Total..... | 1,529,800 | ..... | 18,900 | 619,100 | 891,800 |
| Wisconsin: | | | | | |
| 1..... | 168,000 | ..... | ..... | 29,000 | 139,000 |
| 2..... | 139,000 | ..... | ..... | 24,000 | 115,000 |
| 3..... | 18,000 | ..... | ..... | 4,000 | 14,000 |
| 4..... | ..... | ..... | ..... | ..... | ..... |
| Total..... | 325,000 | ..... | ..... | 57,000 | 268,000 |
| Michigan: | | | | | |
| 1..... | 202,000 | 1,000 | 8,000 | 60,000 | 133,000 |
| 2..... | 227,000 | 2,000 | 18,000 | 72,000 | 135,000 |
| 3..... | 48,000 | ..... | ..... | 10,000 | 38,000 |
| 4..... | 1,000 | ..... | ..... | ..... | 1,000 |
| Total..... | 478,000 | 3,000 | 26,000 | 142,000 | 307,000 |
| Regional total.. | 2,332,800 | 3,000 | 44,900 | 818,100 | 1,466,800 |

Table 14. -- Area of tamarack swamp type in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 107,600 | ..... | ..... | 14,200 | 93,400 |
| 2..... | 166,000 | ..... | 3,100 | 37,000 | 125,900 |
| 3..... | 306,300 | ..... | 5,700 | 66,500 | 234,100 |
| 4..... | ..... | ..... | ..... | ..... | ..... |
| 5..... | 52,800 | ..... | ..... | 21,600 | 31,200 |
| 6..... | 24,200 | ..... | 500 | 5,200 | 18,500 |
| Total..... | 656,900 | ..... | 9,300 | 144,500 | 503,100 |
| Wisconsin: | | | | | |
| 1..... | 81,000 | ..... | ..... | 12,000 | 69,000 |
| 2..... | 63,000 | ..... | ..... | 7,000 | 56,000 |
| 3..... | 58,000 | 3,000 | 1,000 | 19,000 | 35,000 |
| 4..... | 1,000 | ..... | ..... | ..... | 1,000 |
| Total..... | 203,000 | 3,000 | 1,000 | 38,000 | 161,000 |
| Michigan: | | | | | |
| 1..... | 130,000 | ..... | 5,000 | 39,000 | 86,000 |
| 2..... | 43,000 | ..... | 1,000 | 7,000 | 35,000 |
| 3..... | 53,000 | ..... | ..... | 5,000 | 48,000 |
| 4..... | 21,000 | ..... | ..... | 8,000 | 13,000 |
| Total..... | 247,000 | ..... | 6,000 | 59,000 | 182,000 |
| Regional total.. | 1,106,900 | 3,000 | 16,300 | 241,500 | 846,100 |

Table 15. -- Area of cedar swamp type in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 81,500 | ..... | 800 | 38,400 | 42,300 |
| 2..... | 76,400 | ..... | 4,600 | 27,000 | 44,800 |
| 3..... | 177,400 | 2,400 | 8,900 | 89,900 | 76,200 |
| 4..... | 29,500 | ..... | 3,200 | 22,800 | 3,500 |
| 5..... | ..... | ..... | ..... | ..... | ..... |
| 6..... | 15,800 | 200 | 800 | 8,000 | 6,800 |
| Total..... | 380,600 | 2,600 | 18,300 | 186,100 | 173,600 |
| Wisconsin: | | | | | |
| 1..... | 103,000 | 3,000 | 10,000 | 35,000 | 55,000 |
| 2..... | 46,000 | ..... | 4,000 | 27,000 | 15,000 |
| 3..... | 52,000 | ..... | 1,000 | 15,000 | 36,000 |
| 4..... | ..... | ..... | ..... | ..... | ..... |
| Total..... | 201,000 | 3,000 | 15,000 | 77,000 | 106,000 |
| Michigan: | | | | | |
| 1..... | 293,000 | 10,000 | 17,000 | 90,000 | 176,000 |
| 2..... | 153,000 | 6,000 | 36,000 | 31,000 | 80,000 |
| 3..... | 180,000 | ..... | 1,000 | 29,000 | 150,000 |
| 4..... | 13,000 | ..... | ..... | 2,000 | 11,000 |
| Total..... | 639,000 | 16,000 | 54,000 | 152,000 | 417,000 |
| Regional total... | 1,220,600 | 21,600 | 87,300 | 415,100 | 696,600 |

Table 16. -- Area of Nonproductive swamp type^{1/} in the Lake States Region,
BY State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|----------------------------|---------------|--------------------------|-----------------------------|--------------|--------------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 192,300 | ..... | ..... | ..... | 192,300 |
| 2..... | 76,400 | ..... | ..... | 1,500 | 74,900 |
| 3..... | 318,300 | ..... | ..... | 3,200 | 315,100 |
| 4..... | 14,700 | ..... | ..... | ..... | 14,700 |
| 5..... | 800 | ..... | ..... | ..... | 800 |
| 6..... | 160,600 | ..... | ..... | 1,700 | 158,900 |
| Total..... | 763,100 | ..... | ..... | 6,400 | 756,700 |
| Wisconsin: | | | | | |
| 1..... | 41,000 | ..... | ..... | ..... | 41,000 |
| 2..... | 9,000 | ..... | ..... | ..... | 9,000 |
| 3..... | ..... | ..... | ..... | ..... | ..... |
| 4..... | ..... | ..... | ..... | ..... | ..... |
| Total..... | 50,000 | ..... | ..... | ..... | 50,000 |
| Michigan: | | | | | |
| 1..... | 6,000 | ..... | ..... | ..... | 6,000 |
| 2..... | 14,000 | ..... | ..... | ..... | 14,000 |
| 3..... | 3,000 | ..... | ..... | ..... | 3,000 |
| 4..... | ..... | ..... | ..... | ..... | ..... |
| Total..... | 23,000 | ..... | ..... | ..... | 23,000 |
| Regional total... | 836,100 | ..... | ..... | 6,400 | 829,700 |

^{1/}Area of deforested swamp is shown in table 20.

Table 17. -- Area of aspen-birch type in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class | | | |
|-------------------------|--------------|-----------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 1,661,100 | 3,100 | 54,100 | 208,000 | 1,395,900 |
| 2..... | 2,314,300 | 3,900 | 132,100 | 491,200 | 1,687,100 |
| 3..... | 1,067,700 | 9,700 | 84,200 | 176,800 | 797,000 |
| 4..... | 686,600 | ..... | 97,800 | 341,300 | 247,500 |
| 5..... | 383,500 | 1,600 | 9,600 | 62,400 | 309,900 |
| 6..... | 196,600 | ..... | ..... | 35,800 | 160,800 |
| Total..... | 6,309,800 | 18,300 | 377,800 | 1,315,500 | 4,598,200 |
| Wisconsin: | | | | | |
| 1..... | 1,674,000 | 4,000 | 17,000 | 278,000 | 1,375,000 |
| 2..... | 2,363,000 | 2,000 | 16,000 | 478,000 | 1,867,000 |
| 3..... | 1,165,000 | 4,000 | 12,000 | 152,000 | 997,000 |
| 4..... | 115,000 | 4,000 | 17,000 | 21,000 | 73,000 |
| Total..... | 5,317,000 | 14,000 | 62,000 | 929,000 | 4,312,000 |
| Michigan: | | | | | |
| 1..... | 998,000 | 9,000 | 35,000 | 234,000 | 720,000 |
| 2..... | 1,084,000 | 3,000 | 19,000 | 289,000 | 773,000 |
| 3..... | 2,644,000 | 1,000 | 10,000 | 440,000 | 2,193,000 |
| 4..... | 319,000 | 4,000 | 3,000 | 44,000 | 268,000 |
| Total..... | 5,045,000 | 17,000 | 67,000 | 1,007,000 | 3,954,000 |
| Regional total. | 16,671,800 | 49,300 | 506,800 | 3,251,500 | 12,864,200 |

Table 18. -- Area of scrub forest type^{1/} in the Lake States Region, by State, economic unit, and size class

| State and economic unit | Total area | Area by size class ^{2/} | | | |
|-------------------------|--------------|----------------------------------|--------------------------|--------------|-----------------|
| | | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking land |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 8,500 | ..... | ..... | ..... | 8,500 |
| 2..... | 123,600 | ..... | ..... | 2,300 | 121,300 |
| 3..... | 4,800 | ..... | ..... | 800 | 4,000 |
| 4..... | ..... | ..... | ..... | ..... | ..... |
| 5..... | 338,100 | ..... | ..... | 238,000 | 100,100 |
| 6..... | 632,900 | ..... | ..... | 150,500 | 482,400 |
| Total..... | 1,107,900 | ..... | ..... | 391,600 | 716,300 |
| Wisconsin: | | | | | |
| 1..... | 19,000 | ..... | ..... | ..... | 19,000 |
| 2..... | 183,000 | 2,000 | ..... | 2,000 | 179,000 |
| 3..... | 307,000 | 19,000 | 4,000 | 14,000 | 270,000 |
| 4..... | 43,000 | 28,000 | 3,000 | 2,000 | 10,000 |
| Total..... | 552,000 | 49,000 | 7,000 | 18,000 | 478,000 |
| Michigan: | | | | | |
| 1..... | 18,000 | ..... | ..... | 1,000 | 17,000 |
| 2..... | 4,000 | ..... | ..... | 1,000 | 3,000 |
| 3..... | ..... | ..... | ..... | ..... | ..... |
| 4..... | 21,000 | ..... | ..... | 11,000 | 10,000 |
| Total..... | 43,000 | ..... | ..... | 13,000 | 30,000 |
| Regional total... | 1,702,900 | 49,000 | 7,000 | 422,600 | 1,224,300 |

^{1/}Scrub oak forest in Michigan unit 3 included with oak type, in table 11.

^{2/}Small acreages of scrub forest in Minnesota and Michigan included with cordwood and restocking land.

Table 19. -- Area of deforested land in the Lake States Region, by State, economic unit, and character of cover

| State and economic unit | Total area | Area of -- | | |
|-------------------------|--------------|---------------------|-------------------------------|--------------------------------------|
| | | Grass ^{1/} | Brush and marsh ^{2/} | Lightly wooded pasture ^{3/} |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | |
| 1..... | 1,140,900 | 163,100 | 977,800 | ..... |
| 2..... | 890,800 | 198,400 | 692,400 | ..... |
| 3..... | 895,200 | 128,800 | 766,400 | ..... |
| 4 ^{4/} | 79,200 | ..... | 79,200 | ..... |
| 5..... | 690,600 | 43,200 | 239,600 | 407,800 |
| 6..... | 426,400 | 53,700 | 214,700 | 158,000 |
| Total..... | 4,123,100 | 587,200 | 2,970,100 | 565,800 |
| Wisconsin: | | | | |
| 1..... | 772,000 | 262,000 | 410,000 | 100,000 |
| 2..... | 1,005,000 | 255,000 | 550,000 | 200,000 |
| 3..... | 1,260,000 | 191,000 | 360,000 | 709,000 |
| 4..... | 502,000 | 88,000 | 54,000 | 360,000 |
| Total..... | 3,539,000 | 796,000 | 1,374,000 | 1,369,000 |
| Michigan: | | | | |
| 1..... | 600,000 | 295,000 | 260,000 | 45,000 |
| 2..... | 604,000 | 217,000 | 363,000 | 24,000 |
| 3..... | 1,579,000 | 1,003,000 | 432,000 | 144,000 |
| 4..... | 799,000 | 196,000 | 305,000 | 298,000 |
| Total..... | 3,582,000 | 1,711,000 | 1,360,000 | 511,000 |
| Regional total..... | 11,244,100 | 3,094,200 | 5,704,100 | 2,445,800 |

^{1/2/} Includes bracken, sweet fern, and light brush.

Brush so heavy as to make forest planting difficult. Deforested swamps included.

^{3/4/} Farm pastures with a few scattered trees.

^{4/} Grass land included with brush.

Table 20. -- Area of deforested land in the Lake States Region, by State, economic unit, and character of cover

| State and economic unit | Total area | Area by former type | | | |
|-------------------------|--------------|---------------------|--------------|------------------------|--------------------------|
| | | Pine | Swamp | Hardwood ^{1/} | Spruce-fir ^{2/} |
| | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> | <u>Acres</u> |
| Minnesota: | | | | | |
| 1..... | 1,140,900 | 163,200 | 467,700 | 165,500 | 344,500 |
| 2..... | 890,800 | 294,200 | 322,800 | 217,000 | 56,800 |
| 3..... | 895,200 | 46,200 | 621,400 | 102,000 | 125,600 |
| 4..... | 79,200 | ..... | ..... | ..... | 79,200 |
| 5..... | 690,600 | 44,900 | 76,900 | 568,800 | ..... |
| 6..... | 426,400 | 2,400 | 119,500 | 293,100 | 11,400 |
| Total..... | 4,123,100 | 550,900 | 1,608,300 | 1,346,400 | 617,500 |
| Wisconsin: | | | | | |
| 1..... | 772,000 | 218,000 | 135,000 | 261,000 | 158,000 |
| 2..... | 1,005,000 | 199,000 | 189,000 | 392,000 | 225,000 |
| 3..... | 1,260,000 | 212,000 | 100,000 | 929,000 | 19,000 |
| 4..... | 502,000 | 6,000 | ..... | 496,000 | ..... |
| Total..... | 3,539,000 | 635,000 | 424,000 | 2,078,000 | 402,000 |
| Michigan: | | | | | |
| 1..... | 600,000 | 230,000 | 116,000 | 170,000 | 84,000 |
| 2..... | 604,000 | 142,000 | 124,000 | 211,000 | 127,000 |
| 3..... | 1,579,000 | 996,000 | 92,000 | 427,000 | 64,000 |
| 4..... | 799,000 | 107,000 | 39,000 | 643,000 | 10,000 |
| Total..... | 3,582,000 | 1,475,000 | 371,000 | 1,451,000 | 285,000 |
| Regional total..... | 11,244,100 | 2,660,900 | 2,403,300 | 4,875,400 | 1,304,500 |

^{1/} Includes upland hardwood and swamp hardwood.

^{2/} All deforested land in Minnesota unit 4 was arbitrarily classified as spruce-fir.

Table 21. Summary of timber volume^{1/} in the Lake States Region,
by product

| Product | Volume of standing timber | Equivalent in thousand cubic feet of solid wood | |
|--|---------------------------|---|---------|
| | | Volume | Percent |
| Saw timber ^{2/} M ft.b.m. | 57,615,740 | 9,520,990 | 32.5 |
| Cordwood ^{3/} in: | | | |
| Small trees..... Cords.... | 122,286,000 | 8,804,200 | 30.0 |
| Tops and limbs..... Cords.... | 70,394,000 | 4,223,490 | 14.4 |
| Cull in sawlog trees. Cords.... | 30,289,000 | 1,992,980 | 6.8 |
| All cordwood..... Cords.... | 222,969,000 | 15,020,670 | 51.2 |
| Cedar products: | | | |
| Poles..... Pieces.... | 41,518,000 | 407,130 | 1.4 |
| Round posts..... Pieces.... | 224,774,000 | 348,850 | 1.2 |
| Split posts..... Pieces.... | 99,715,000 | 164,850 | 0.6 |
| Other cedar volume ^{4/} Cords.... | 5,256,000 | 346,920 | 1.2 |
| All cedar products..... | | 1,267,750 | 4.4 |
| All merchantable trees..... | | 25,809,410 | 88.1 |
| Cull trees..... Cords.... | 52,166,000 | 3,494,830 | 11.9 |
| All live trees..... | | 29,304,240 | 100.0 |

^{1/} Dead trees not included.

^{2/} International 1/4" kerf rule.

^{3/} Exclusive of cedar, and of cordwood cut from saw timber. Small trees include scrub trees of large diameter unsuitable for sawlogs.

^{4/} "Other cedar volume" includes small cedar trees containing no piece products, and tops above piece products.

TOTAL VOLUME OF TIMBER LAKE STATES REGION

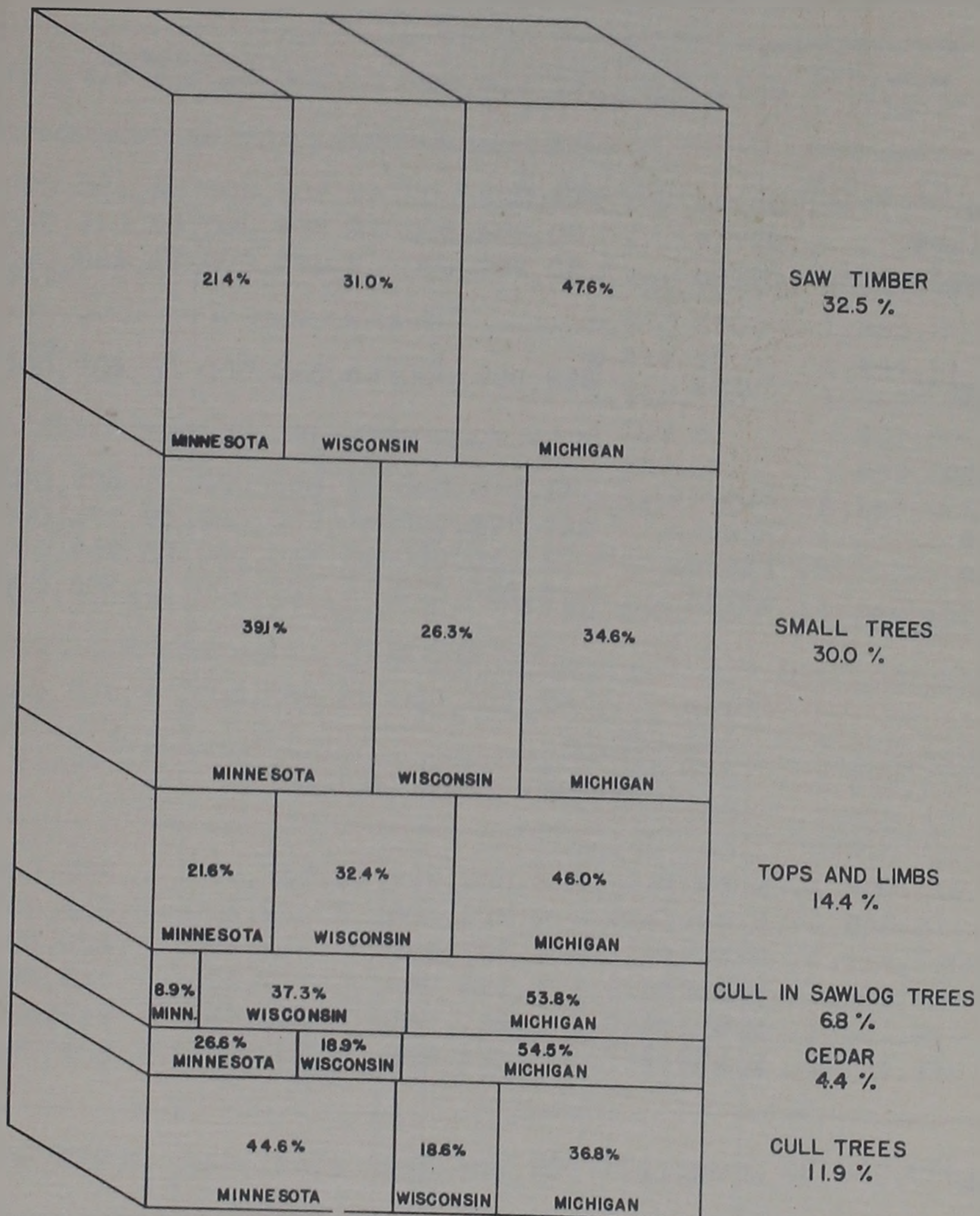


Figure 3

Table 22. -- Summary of timber volume^{1/} in the Lake States Region, by product and State

| Product | Regional total | Minnesota | Wisconsin | Michigan |
|--|----------------|------------|------------|-------------|
| Saw timber ^{2/} M ft.b.m. | 57,615,740 | 12,454,740 | 16,612,000 | 28,549,000 |
| Cordwood ^{3/} | | | | |
| Small trees..... Cords.... | 122,286,000 | 47,767,000 | 32,195,000 | 42,324,000 |
| Tops and limbs..... Cords.... | 70,394,000 | 15,209,000 | 22,834,000 | 32,351,000 |
| Cull in sawlog trees Cords.... | 30,289,000 | 2,372,000 | 11,428,000 | 16,489,000 |
| All cordwood..... Cords.... | 222,969,000 | 65,348,000 | 66,457,000 | 91,164,000 |
| Cedar products | | | | |
| Poles..... Pieces.... | 41,518,000 | 11,059,000 | 7,589,000 | 22,870,000 |
| Round posts..... Pieces.... | 224,774,000 | 61,953,000 | 49,174,000 | 113,647,000 |
| Split posts..... Pieces.... | 99,715,000 | 15,318,000 | 25,959,000 | 58,438,000 |
| Other ^{4/} Cords.... | 5,256,000 | 1,787,000 | 788,000 | 2,681,000 |
| Cull trees..... Cords.... | 52,166,000 | 23,252,000 | 9,719,000 | 19,195,000 |

Equivalent Cubic Volume

| | | | | |
|----------------------------------|------------|-----------|-----------|------------|
| Saw timber..... M cu.ft.. | 9,520,990 | 2,036,990 | 2,953,000 | 4,531,000 |
| Small trees..... M cu.ft.. | 8,804,200 | 3,439,200 | 2,318,000 | 3,047,000 |
| Tops and limbs..... M cu.ft.. | 4,223,490 | 912,490 | 1,370,000 | 1,941,000 |
| Cull in sawlog trees.. M cu.ft.. | 1,992,980 | 177,980 | 743,000 | 1,072,000 |
| Cedar..... M cu.ft.. | 1,267,750 | 336,750 | 240,000 | 691,000 |
| Cull trees..... M cu.ft.. | 3,494,830 | 1,557,830 | 651,000 | 1,286,000 |
| All products..... M cu.ft.. | 29,304,240 | 8,461,240 | 8,275,000 | 12,568,000 |

^{1/} Dead trees not included.

^{2/} International 1/4" kerf rule.

^{3/} Exclusive of cedar, and of cordwood cut from saw timber. Small trees include scrub trees of large diameter unsuitable for sawlogs.

^{4/} Includes small cedar trees containing no piece products, and tops above piece products.

Table 23. -- Volume of saw timber in the Lake States Region, by species, according to two log rules

| Species | Saw-timber volume | | Average overrun |
|---|--|------------------|-----------------|
| | International rule, $\frac{1}{4}$ " kerf | Scribner rule | |
| | <u>M bd. ft.</u> | <u>M bd. ft.</u> | <u>Percent</u> |
| Softwoods | | | |
| White pine..... | 3,753,200 | 3,233,550 | 16.1 |
| Red pine..... | 1,478,380 | 1,226,800 | 20.5 |
| Jack pine..... | 2,677,790 | 2,244,920 | 19.3 |
| Spruce..... | 2,362,730 | 1,969,150 | 20.0 |
| Balsam fir..... | 1,089,310 | 901,370 | 20.9 |
| Tamarack..... | 297,340 | 239,800 | 24.0 |
| Hemlock..... | 9,222,000 | 8,162,000 | 13.0 |
| All softwoods..... | 20,880,750 | 17,977,590 | 16.1 |
| Hardwoods | | | |
| Sugar maple..... | 10,538,120 | 9,318,110 | 13.1 |
| Yellow birch..... | 5,252,230 | 4,646,610 | 13.0 |
| Basswood..... | 2,039,200 | 1,801,440 | 13.2 |
| Elm..... | 3,178,690 | 2,818,650 | 12.8 |
| Beech..... | 1,496,000 | 1,320,000 | 13.3 |
| Oak ^{1/} | 5,297,790 | 4,635,320 | 14.3 |
| Aspen..... | 4,125,700 | 3,414,530 | 20.8 |
| Paper birch..... | 1,288,340 | 1,084,490 | 18.8 |
| Soft maple..... | 1,742,640 | 1,532,290 | 13.7 |
| Miscellaneous hardwoods ^{2/} | 1,776,280 | 1,526,440 | 16.4 |
| All hardwoods..... | 36,734,990 | 32,097,880 | 14.4 |
| All species..... | 57,615,740 | 50,075,470 | 15.1 |

^{1/} Includes both red and white oak.

^{2/} Principally black ash, hickory, and hop-hornbeam.

Table 24. -- Volume of saw timber in the Lake States Region, by species and State, by International rule, 1/4" kerf

| Species | Regional total | Minnesota | Wisconsin | Michigan |
|---|----------------|--------------|--------------|--------------|
| | M feet, b.m. | M feet, b.m. | M feet, b.m. | M feet, b.m. |
| Softwoods | | | | |
| White pine..... | 3,753,200 | 1,598,200 | 1,145,000 | 1,010,000 |
| Red pine..... | 1,478,380 | 998,380 | 293,000 | 187,000 |
| Jack pine..... | 2,677,790 | 2,262,790 | 246,000 | 169,000 |
| Spruce..... | 2,362,730 | 1,240,730 | 138,000 | 984,000 |
| Balsam-fir..... | 1,089,310 | 350,310 | 133,000 | 606,000 |
| Tamarack..... | 297,340 | 137,340 | 82,000 | 78,000 |
| Hemlock..... | 9,222,000 | ..... | 2,672,000 | 6,550,000 |
| All softwoods.. | 20,880,750 | 6,587,750 | 4,709,000 | 9,584,000 |
| Hardwoods | | | | |
| Sugar maple..... | 10,538,120 | 306,120 | 2,809,000 | 7,423,000 |
| Yellow birch..... | 5,252,230 | 93,230 | 1,388,000 | 3,771,000 |
| Basswood..... | 2,039,200 | 451,200 | 828,000 | 760,000 |
| Elm..... | 3,178,690 | 701,690 | 1,229,000 | 1,248,000 |
| Beech..... | 1,496,000 | ..... | 170,000 | 1,326,000 |
| Oak ^{1/} | 5,297,790 | 761,790 | 3,325,000 | 1,211,000 |
| Aspen ^{2/} | 4,125,700 | 2,366,700 | 804,000 | 955,000 |
| Paper birch..... | 1,288,340 | 783,340 | 160,000 | 345,000 |
| Soft maple..... | 1,742,640 | 110,640 | 435,000 | 1,197,000 |
| Miscellaneous hardwoods ^{3/} | 1,776,280 | 292,280 | 755,000 | 729,000 |
| All hardwoods.. | 36,734,990 | 5,866,990 | 11,903,000 | 18,965,000 |
| All species..... | 57,615,740 | 12,454,740 | 16,612,000 | 28,549,000 |

1/ Includes both red and white oak.

2/ Includes balsam poplar and cottonwood.

3/ Principally black ash, hickory, and hop-hornbeam.

SAW-TIMBER VOLUME IN THE LAKE STATES MILLION BOARD FEET

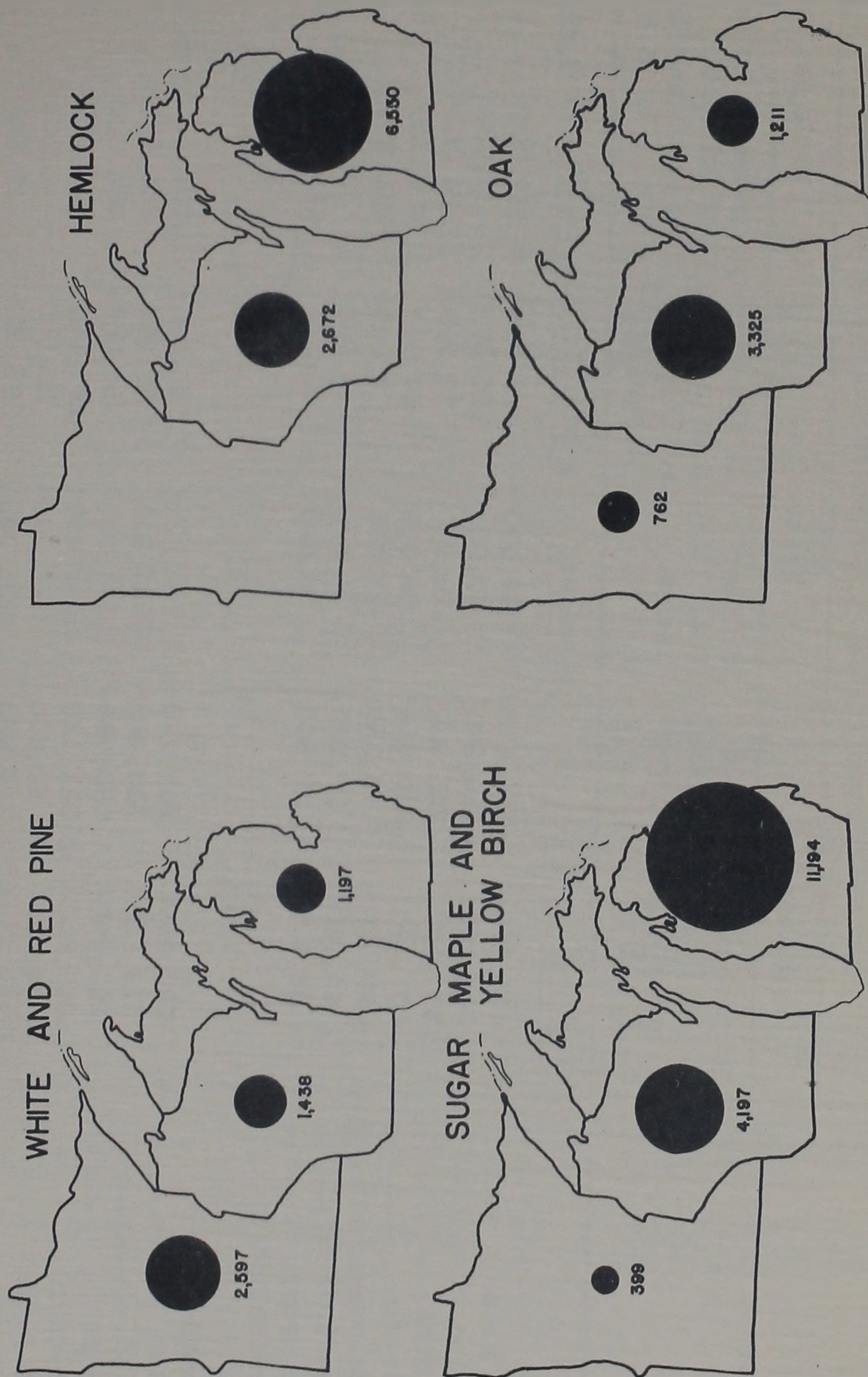


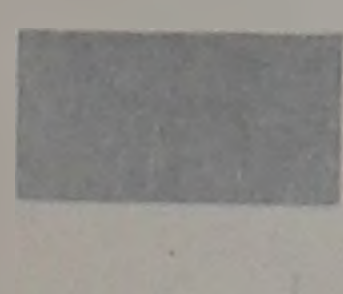
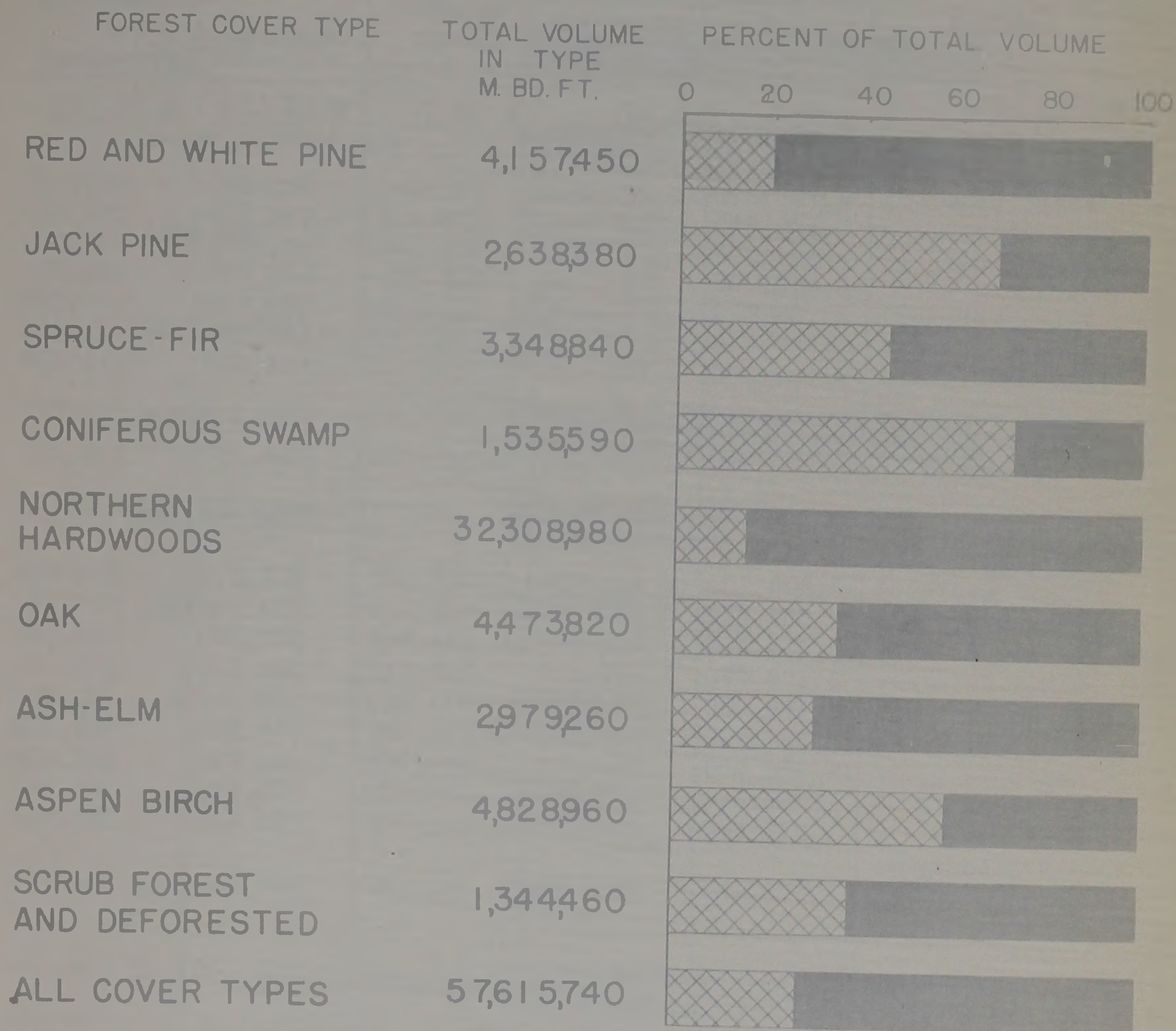
Figure 4

Table 25. -- Volume of saw timber in the Lake States Region, by forest cover type, State, and diameter group

| Saw-timber volume, <u>1</u> / ₂ by State and diameter group | | | | | | |
|--|--|--|------------------------------------|--|------------------------------------|--|
| Forest cover type | Minnesota | | Wisconsin | | Michigan | |
| | In trees 9.0 to 13.0 inches d.b.h. ^{2/} | In trees 13.0 inches and larger d.b.h. | In trees 9.0 to 13.0 inches d.b.h. | In trees 13.0 inches and larger d.b.h. | In trees 9.0 to 13.0 inches d.b.h. | In trees 13.0 inches and larger d.b.h. |
| | <u>M bd. ft.</u> | <u>M bd. ft.</u> | <u>M bd. ft.</u> | <u>M bd. ft.</u> | <u>M bd. ft.</u> | <u>M bd. ft.</u> |
| White pine..... | 158,350 | 1,294,460 | 267,000 | 776,000 | 137,000 | 473,000 |
| Red pine..... | 143,770 | 616,870 | 80,000 | 114,000 | 36,000 | 61,000 |
| Jack pine..... | 1,514,500 | 725,880 | 170,000 | 57,000 | 124,000 | 47,000 |
| Spruce-fir..... | 601,430 | 820,410 | 206,000 | 132,000 | 709,000 | 880,000 |
| Spruce swamp..... | 527,720 | 73,330 | 21,000 | 2,000 | 131,000 | 84,000 |
| Tamarack swamp..... | 65,900 | 10,200 | 36,000 | 14,000 | 35,000 | 7,000 |
| Cedar swamp..... | 96,870 | 37,860 | 56,000 | 40,000 | 146,000 | 151,000 |
| Nonproductive swamp..... | 710 | | | | | |
| Northern hardwoods..... | 390,990 | 947,990 | 1,760,000 | 7,163,000 | 2,754,000 | 19,293,000 |
| Oak..... | 213,360 | 313,460 | 1,099,000 | 1,850,000 | 256,000 | 742,000 |
| Ash-elm..... | 229,500 | 390,760 | 386,000 | 764,000 | 292,000 | 917,000 |
| Aspen-birch..... | 1,557,850 | 1,311,110 | 662,000 | 281,000 | 619,000 | 398,000 |
| Scrub forest..... | 34,550 | 62,490 | 25,000 | 35,000 | 1,000 | 2,000 |
| Deforested..... | 136,140 | 178,280 | 221,000 | 395,000 | 95,000 | 159,000 |
| All cover types..... | 5,671,640 | 6,783,100 | 4,989,000 | 11,623,000 | 5,335,000 | 23,214,000 |

$\frac{1}{2}$ By International 1/4"-kerf rule.
 $\frac{2}{2}$ Diameter at breast height.

DIVISION OF SAW TIMBER VOLUME BETWEEN LARGE AND SMALL TREES LAKE STATES REGION



IN TREES 13.0 INCHES AND
LARGER IN DIAMETER
AT BREAST HEIGHT



IN TREES 9.0 INCHES TO
13.0 INCHES IN DIAMETER
AT BREAST HEIGHT

Figure 5

Table 26. -- Volume of saw timber in the Lake States Region, by species and size class

| Species | Volume ^{1/} , by size class of stand | | | | |
|--|---|-----------------------|--------------------------|-----------------|---------------------------|
| | All size classes | Old-growth saw timber | Second-growth saw timber | Cordwood | Restocking and deforested |
| | <u>M bd.ft.</u> | <u>M bd.ft.</u> | <u>M bd.ft.</u> | <u>M bd.ft.</u> | <u>M bd.ft.</u> |
| Softwoods | | | | | |
| White pine..... | 3,753,200 | 2,203,520 | 749,070 | 533,650 | 266,960 |
| Red pine..... | 1,478,380 | 518,140 | 475,200 | 254,000 | 231,040 |
| Jack pine..... | 2,677,790 | 50,390 | 1,805,100 | 604,460 | 217,840 |
| Spruce..... | 2,362,730 | 490,750 | 855,810 | 879,840 | 136,330 |
| Balsam-fir..... | 1,089,310 | 271,340 | 408,700 | 323,740 | 85,530 |
| Tamarack..... | 297,340 | 18,020 | 64,140 | 159,300 | 55,880 |
| Hemlock..... | 9,222,000 | 8,221,000 | 665,000 | 164,000 | 172,000 |
| All softwoods... | 20,880,750 | 11,773,160 | 5,023,020 | 2,918,990 | 1,165,580 |
| Hardwoods | | | | | |
| Sugar maple... | 10,538,120 | 8,418,670 | 1,264,530 | 282,370 | 572,550 |
| Yellow birch.. | 5,252,230 | 3,930,890 | 759,210 | 258,630 | 303,500 |
| Basswood..... | 2,039,200 | 1,263,520 | 459,160 | 153,180 | 163,340 |
| Elm..... | 3,178,690 | 1,662,610 | 746,440 | 306,610 | 463,030 |
| Beech..... | 1,496,000 | 1,132,000 | 249,000 | 55,000 | 60,000 |
| Oak..... | 5,297,790 | 1,840,130 | 2,090,080 | 838,390 | 529,190 |
| Aspen..... | 4,125,700 | 360,690 | 1,856,560 | 1,448,540 | 459,910 |
| Paper birch... | 1,288,340 | 175,220 | 422,680 | 525,100 | 165,340 |
| Soft maple... | 1,742,640 | 1,027,630 | 408,200 | 199,430 | 107,380 |
| Miscellaneous hardwoods ^{2/} .. | 1,776,280 | 638,100 | 641,480 | 290,910 | 205,790 |
| All hardwoods.. | 36,734,990 | 20,449,460 | 8,897,340 | 4,358,160 | 3,030,030 |
| All species..... | 57,615,740 | 32,222,620 | 13,920,360 | 7,277,150 | 4,195,610 |

^{1/} By International 1/4"-kerf rule.

^{2/} Principally black ash, hickory, and hop-hornbeam.

VOLUME OF SAW TIMBER IN THE LAKE STATES BY SPECIES AND SIZE CLASS OF STAND

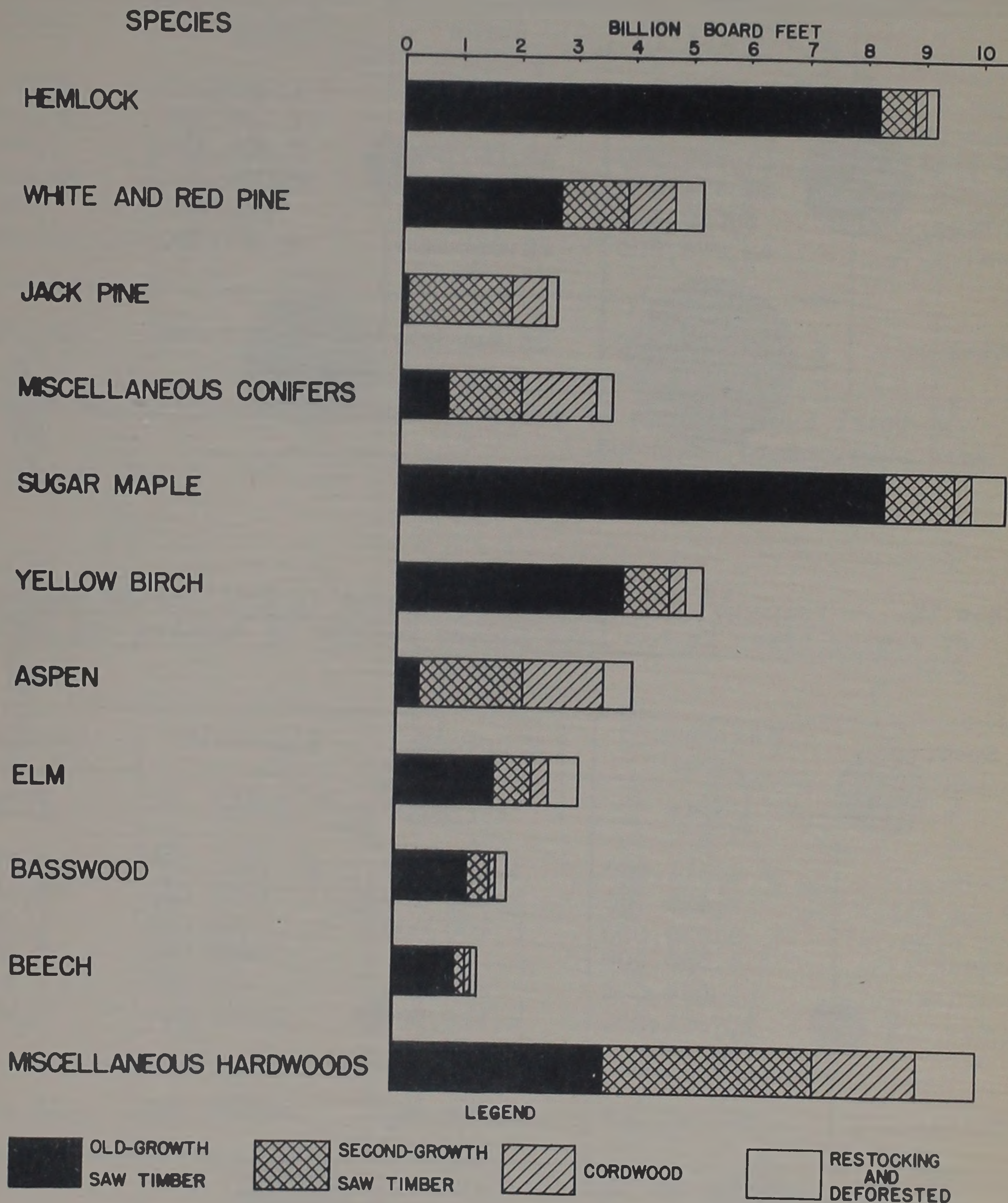


Figure 6

Table 27. -- Total volume^{1/} of pulping species in the Lake States Region

| Species | Regional total | Minnesota | Wisconsin | Michigan |
|--------------|-------------------|--------------|--------------|--------------|
| | <u>Cords</u> | <u>Cords</u> | <u>Cords</u> | <u>Cords</u> |
| Spruce..... | 16,628,000 | 10,292,000 | 1,045,000 | 5,291,000 |
| Balsam fir.. | 13,369,000 | 5,134,000 | 2,108,000 | 6,127,000 |
| Jack pine... | 17,960,000 | 13,565,000 | 2,406,000 | 1,989,000 |
| Hemlock..... | 33,774,000 | ..... | 10,358,000 | 23,416,000 |
| Tamarack.... | 3,079,000 | 1,639,000 | 648,000 | 792,000 |
| Aspen..... | 43,776,000 | 22,081,000 | 9,647,000 | 12,048,000 |
| Total..... | 128,586,000 | 52,711,000 | 26,212,000 | 49,663,000 |

^{1/} Total cubic volume of pulpwood species, including saw timber and some substandard pulpwood.

Table 28. -- Volume^{1/} of high-grade pulpwood in small trees and in tops of sawlog trees in the Lake States Region, by species and State

| Species | Regional total | Minnesota | Wisconsin | Michigan |
|--------------|-------------------|--------------|--------------|--------------|
| | <u>Cords</u> | <u>Cords</u> | <u>Cords</u> | <u>Cords</u> |
| Spruce..... | 8,811,000 | 5,429,000 | 611,000 | 2,771,000 |
| Balsam fir.. | 7,435,000 | 2,551,000 | 956,000 | 3,928,000 |
| Jack pine... | 8,038,000 | 5,400,000 | 1,403,000 | 1,235,000 |
| Hemlock..... | 3,530,000 | ..... | 1,092,000 | 2,438,000 |
| Tamarack.... | 1,564,000 | 644,000 | 412,000 | 508,000 |
| Aspen..... | 10,062,000 | 4,216,000 | 1,609,000 | 4,237,000 |
| Total..... | 39,440,000 | 18,240,000 | 6,083,000 | 15,117,000 |

^{1/} Excludes sawlogs and substandard material.

TOTAL VOLUME OF PULPING SPECIES IN THE LAKE STATES THOUSAND CORDS

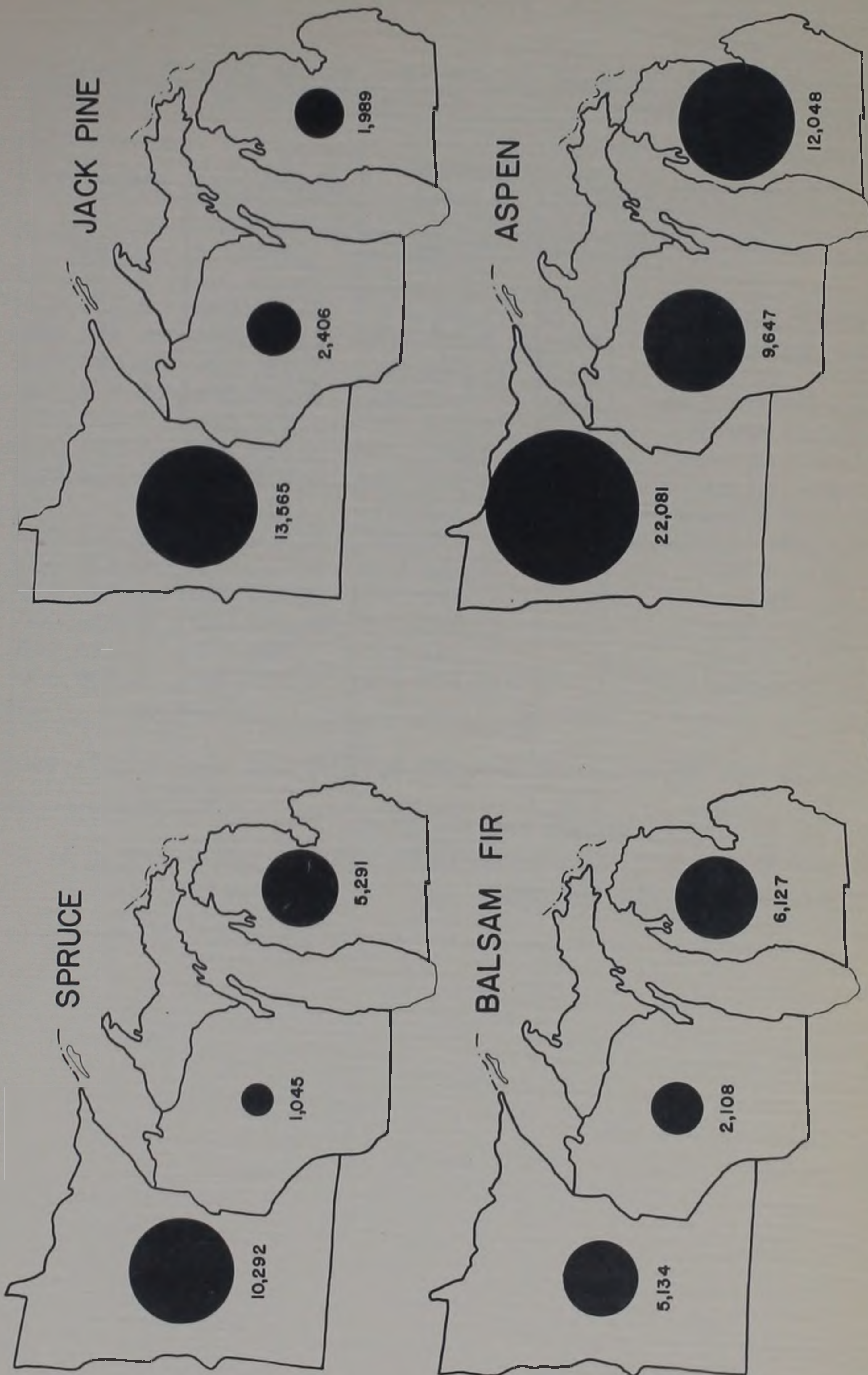


Figure 2

Table 29. -- Volume^{1/} of cordwood in the Lake States Region, by cover type and State

| Forest cover type ^{2/} | Regional total | Minnesota | Wisconsin | Michigan |
|---------------------------------|----------------|--------------|--------------|--------------|
| | <u>Cords</u> | <u>Cords</u> | <u>Cords</u> | <u>Cords</u> |
| White pine..... | 6,929,000 | 3,238,000 | 2,013,000 | 1,678,000 |
| Red pine..... | 2,301,000 | 1,407,000 | 427,000 | 467,000 |
| Jack pine..... | 16,220,000 | 12,090,000 | 2,096,000 | 2,034,000 |
| Spruce-fir..... | 21,076,000 | 8,365,000 | 3,030,000 | 9,681,000 |
| Spruce swamp..... | 10,231,000 | 7,912,000 | 508,000 | 1,811,000 |
| Tamarack swamp..... | 2,047,000 | 1,118,000 | 385,000 | 544,000 |
| Cedar swamp..... | 5,443,000 | 2,219,000 | 772,000 | 2,452,000 |
| Nonproductive swamp..... | 114,000 | 114,000 | ..... | ..... |
| Northern hardwoods..... | 102,621,000 | 8,930,000 | 29,741,000 | 63,950,000 |
| Oak..... | 26,111,000 | 4,601,000 | 15,475,000 | 6,035,000 |
| Ash-elm..... | 18,477,000 | 5,384,000 | 6,478,000 | 6,615,000 |
| Aspen-birch..... | 47,943,000 | 25,863,000 | 9,819,000 | 12,261,000 |
| Scrub forest..... | 4,054,000 | 2,826,000 | 1,124,000 | 104,000 |
| Deforested..... | 11,568,000 | 4,533,000 | 4,308,000 | 2,727,000 |
| All forest types..... | 275,135,000 | 88,600,000 | 76,176,000 | 110,359,000 |

^{1/} Cedar volumes not included.

^{2/} Scrub forest in northern half of Lower Peninsula of Michigan is included with the oak type.

Table 30. -- Cedar volume in the Lake States Region, by product and State

| Product | Regional total | Minnesota | Wisconsin | Michigan |
|-------------------------------------|-------------------|-----------|-----------|----------|
| Round posts..... M pieces | 224,774 | 61,953 | 49,174 | 113,647 |
| Split posts..... M pieces | 99,715 | 15,318 | 25,959 | 58,438 |
| Poles | | | | |
| 20 feet or less.... M pieces | 20,867 | 8,375 | 3,226 | 9,266 |
| 25 feet..... M pieces | 11,749 | 1,864 | 2,598 | 7,287 |
| 30 feet..... M pieces | 5,409 | 592 | 1,132 | 3,685 |
| 35 feet..... M pieces | 2,685 | 228 | 507 | 1,950 |
| 40 feet..... M pieces | 529 | ..... | 77 | 452 |
| 45 feet..... M pieces | 279 | ..... | 49 | 230 |
| Total poles..... M pieces | 41,518 | 11,059 | 7,589 | 22,870 |
| Unmerchantable wood..... M cords | 5,256 | 1,787 | 788 | 2,681 |
| Total volume..... M cu.ft. | 1,267,750 | 336,750 | 240,000 | 691,000 |

Table 31. -- Total cubic volume of timber in the Lake States Region, by species and State

| Species | Regional total | Minnesota | Wisconsin | Michigan |
|--|-------------------|-----------------|-----------------|-----------------|
| | <u>M cu.ft.</u> | <u>M cu.ft.</u> | <u>M cu.ft.</u> | <u>M cu.ft.</u> |
| Softwoods | | | | |
| White pine..... | 929,170 | 352,170 | 310,000 | 267,000 |
| Red pine..... | 391,320 | 231,320 | 90,000 | 70,000 |
| Jack pine..... | 1,364,430 | 1,034,430 | 181,000 | 149,000 |
| Spruce..... | 1,285,040 | 792,040 | 78,000 | 415,000 |
| Balsam fir..... | 1,005,490 | 383,490 | 157,000 | 465,000 |
| Tamarack..... | 230,230 | 121,230 | 49,000 | 60,000 |
| Hemlock..... | 2,497,000 | ..... | 766,000 | 1,731,000 |
| Cedar..... | 1,267,750 | 336,750 | 240,000 | 691,000 |
| All softwoods..... | 8,970,430 | 3,251,430 | 1,871,000 | 3,848,000 |
| Hardwoods ^{1/} | | | | |
| Sugar maple..... | 3,451,390 | 121,390 | 982,000 | 2,348,000 |
| Yellow birch..... | 1,782,210 | 33,210 | 563,000 | 1,186,000 |
| Basswood..... | 823,640 | 203,640 | 353,000 | 267,000 |
| Elm..... | 1,285,630 | 282,630 | 519,000 | 484,000 |
| Beech..... | 488,000 | ..... | 71,000 | 417,000 |
| Oaks..... | 2,565,790 | 439,790 | 1,490,000 | 636,000 |
| Aspen..... | 3,135,230 | 1,588,230 | 680,000 | 867,000 |
| Paper birch..... | 941,440 | 549,440 | 147,000 | 245,000 |
| Soft maple..... | 890,530 | 46,530 | 259,000 | 585,000 |
| Miscellaneous hardwoods ^{2/} | 1,051,180 | 206,180 | 446,000 | 399,000 |
| Scrub trees..... | 423,940 | 180,940 | 243,000 | ..... |
| All hardwoods..... | 16,838,980 | 3,651,980 | 5,753,000 | 7,434,000 |
| All species..... | 25,809,410 | 6,903,410 | 7,624,000 | 11,282,000 |

^{1/} For Michigan the volume of scrub hardwoods is combined with that of oaks.

^{2/} Principally black ash, hickory, and hop-hornbeam.

Table 32. -- Quality of hardwood saw timber in the Lake States Region,
by species and State

| Species | Percentage of volume in each log grade | | | | | | | | | | | |
|--|--|------|------|-----------|-------|-------|-----------|------|------|----------|------|------|
| | Regional total | | | Minnesota | | | Wisconsin | | | Michigan | | |
| | No.1 | No.2 | No.3 | No.1 | No.2 | No.3 | No.1 | No.2 | No.3 | No.1 | No.2 | No.3 |
| Sugar maple.. | 26 | 47 | 27 | 21 | 43 | 36 | 16 | 51 | 33 | 30 | 45 | 25 |
| Yellow birch. | 36 | 43 | 21 | 4 | 59 | 37 | 31 | 45 | 24 | 39 | 41 | 20 |
| Basswood..... | 29 | 45 | 26 | 12 | 45 | 43 | 28 | 54 | 18 | 42 | 35 | 23 |
| Elm..... | 27 | 52 | 21 | 16 | 54 | 30 | 26 | 58 | 16 | 35 | 44 | 21 |
| Beech..... | 19 | 50 | 31 | ..... | ..... | ..... | 20 | 41 | 39 | 19 | 51 | 30 |
| Oak ^{1/} | 16 | 54 | 30 | 5 | 44 | 51 | 16 | 59 | 25 | 23 | 46 | 31 |
| Aspen ^{2/} | 5 | 48 | 47 | 5 | 54 | 41 | 4 | 52 | 44 | 7 | 31 | 62 |
| Paper birch.. | 11 | 48 | 41 | 11 | 45 | 44 | 11 | 53 | 36 | 11 | 50 | 39 |
| Soft maple... | 13 | 48 | 39 | 5 | 36 | 59 | 15 | 52 | 33 | 14 | 47 | 39 |
| Miscellaneous hardwoods ^{3/} | 13 | 49 | 38 | 5 | 39 | 56 | 12 | 56 | 32 | 16 | 46 | 38 |
| All hardwoods | 22 | 48 | 30 | 8 | 49 | 43 | 19 | 54 | 27 | 28 | 44 | 28 |

^{1/} Includes both red and white oak.

^{2/} Includes cottonwood and balsam poplar.

^{3/} Principally black ash, hickory, and hop-hornbeam.

Table 33. -- Average volume of saw timber per acre in the Lake States Region, by cover type and State

| Forest cover type | Regional average | Minnesota | Wisconsin | Michigan |
|--------------------------|---------------------|------------|------------|------------|
| | Board feet | Board feet | Board feet | Board feet |
| White pine..... | 5,011 | 6,217 | 4,847 | 3,571 |
| Red pine..... | 3,099 | 4,462 | 2,262 | 1,169 |
| Jack pine..... | 975 | 1,770 | 341 | 221 |
| Spruce-fir..... | 1,064 | 1,307 | 530 | 1,118 |
| Spruce swamp..... | 360 | 393 | 71 | 450 |
| Tamarack swamp..... | 152 | 116 | 246 | 170 |
| Cedar swamp..... | 434 | 353 | 484 | 465 |
| Nonproductive swamp..... | 1 | 1 | 3 | ..... |
| Northern hardwoods..... | 3,933 | 1,498 | 3,251 | 4,818 |
| Oak..... | 1,271 | 1,107 | 1,698 | 764 |
| Ash-elm..... | 1,510 | 1,007 | 1,707 | 1,771 |
| Aspen-birch..... | 280 | 417 | 177 | 202 |
| Scrub forest..... | 140 | 179 | 108 | 61 |
| Deforested..... | 105 | 76 | 174 | 71 |
| All forest types..... | 1,036 | 635 | 980 | 1,497 |

Table 34. -- Average volume^{1/} of timber per acre in the Lake States Region, by forest cover type and size class

| Forest cover type | Volume, by size class | | | | | | | | | |
|-------------------------------|-----------------------|-----------|-----------------------|-----------|--------------------------|-----------|-----------|-----------|---------------------------|---------|
| | All classes | | Old-growth saw timber | | Second-growth saw timber | | Cordwood | | Restocking and deforested | |
| | Bd. ft. | Cu. ft. | Bd. ft. | Cu. ft. | Bd. ft. | Cu. ft. | Bd. ft. | Cu. ft. | Bd. ft. | Cu. ft. |
| White pine | 5,011 | 1,510 | 10,083 | 2,529 | 4,435 | 1,550 | 1,504 | 921 | 190 | 127 |
| Red pine | 3,099 | 930 | 10,972 | 2,242 | 5,686 | 1,514 | 1,020 | 719 | 103 | 83 |
| Jack pine | 975 | 527 | 7,309 | 1,909 | 6,045 | 2,093 | 540 | 654 | 108 | 93 |
| Spruce-fir | 1,064 | 632 | 6,582 | 2,378 | 4,054 | 1,714 | 936 | 779 | 261 | 207 |
| Spruce-swamp | 360 | 358 | 6,643 | 2,260 | 3,680 | 1,589 | 727 | 800 | 40 | 70 |
| Tamarack swamp | 152 | 162 | 4,403 | 1,397 | 3,084 | 1,274 | 378 | 506 | 16 | 38 |
| Cedar swamp | 434 | 732 | 3,175 | 3,168 | 1,825 | 2,303 | 526 | 1,095 | 120 | 244 |
| Nonproductive swamp | 1 | 9 | | | | | 72 | 311 | | 7 |
| Northern hardwoods | 3,933 | 1,317 | 9,950 | 2,898 | 3,787 | 1,575 | 824 | 680 | 343 | 191 |
| Oaks | 1,271 | 659 | 5,089 | 1,694 | 3,496 | 1,534 | 645 | 642 | 125 | 108 |
| Ash-elm | 1,510 | 763 | 5,583 | 1,908 | 3,467 | 1,555 | 731 | 679 | 261 | 179 |
| Aspen-birch | 280 | 211 | 6,086 | 1,967 | 3,721 | 1,498 | 556 | 624 | 58 | 51 |
| Scrub forest | 140 | 234 | 659 | 896 | 806 | 1,084 | 277 | 550 | 43 | 52 |
| Deforested | | | | | | | | | 105 | 61 |
| All cover types | 1,036 | 464 | 8,985 | 2,650 | 3,937 | 1,629 | 671 | 688 | 111 | 82 |

^{1/} Board-foot volumes are by International 1/4"-kerf rule.

Table 35. -- Average cubic volume of total stand per acre in the Lake States Region, by forest cover type and State

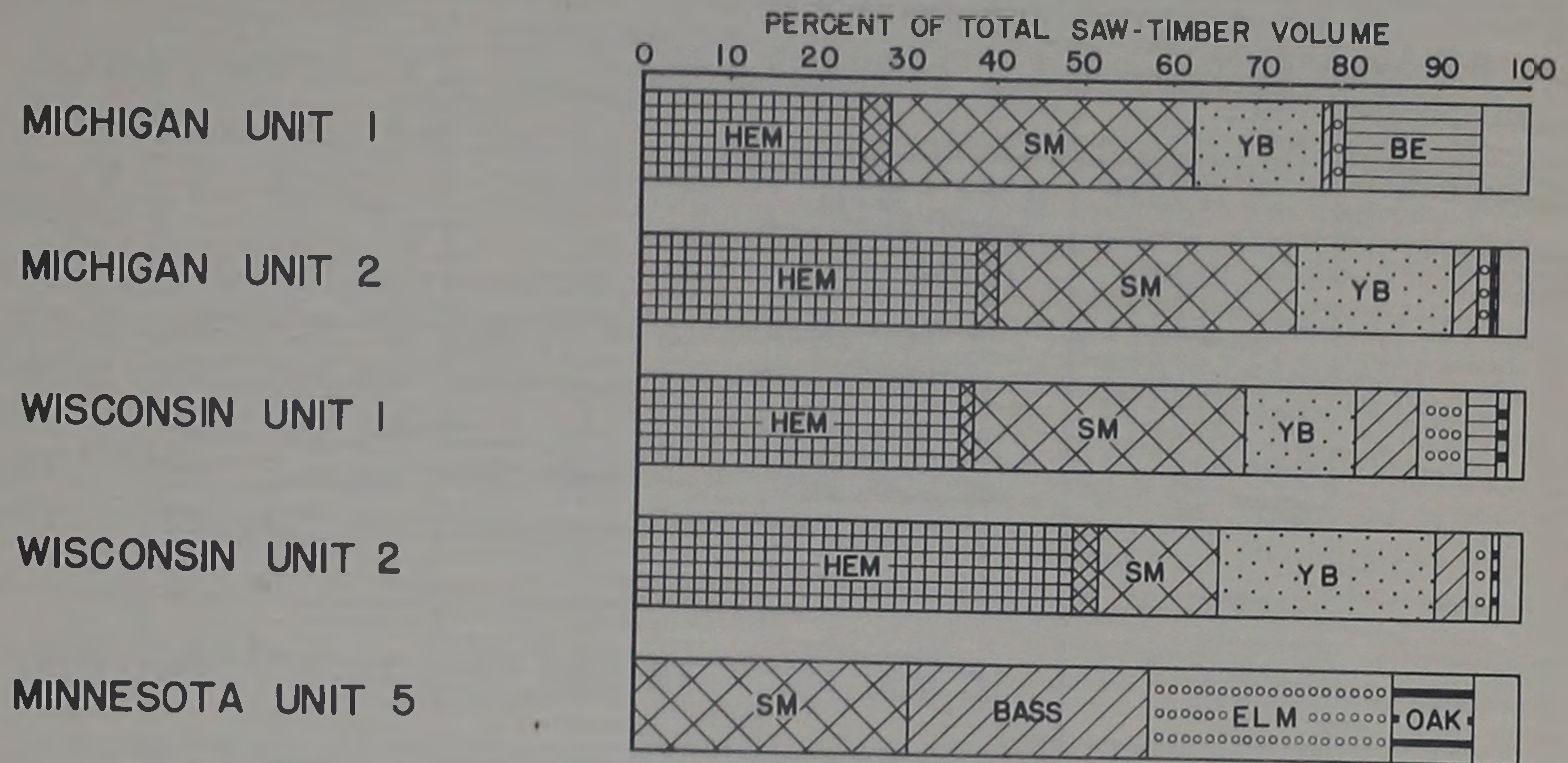
| Forest cover type | Regional average | Minnesota | Wisconsin | Michigan |
|--------------------------|------------------|------------|------------|------------|
| | Cubic feet | Cubic feet | Cubic feet | Cubic feet |
| White pine..... | 1,510 | 1,733 | 1,495 | 1,224 |
| Red pine..... | 930 | 1,166 | 800 | 579 |
| Jack pine..... | 527 | 852 | 279 | 207 |
| Spruce-fir..... | 632 | 648 | 449 | 703 |
| Spruce swamp..... | 358 | 404 | 127 | 368 |
| Tamarack swamp..... | 162 | 140 | 209 | 184 |
| Cedar swamp..... | 732 | 775 | 853 | 668 |
| Nonproductive swamp..... | 9 | 9 | 2 | 14 |
| Northern hardwoods..... | 1,317 | 674 | 1,178 | 1,526 |
| Oak..... | 659 | 738 | 831 | 402 |
| Ash-elm..... | 763 | 522 | 887 | 860 |
| Aspen-birch..... | 211 | 270 | 153 | 190 |
| Scrub forest..... | 234 | 325 | 153 | 144 |
| Deforested..... | 61 | 47 | 95 | 43 |
| All forest types..... | 464 | 352 | 450 | 591 |

Table 36. -- Average volume^{1/} of saw timber per acre in old-growth saw-timber stands in the Lake States Region, by forest cover type and State

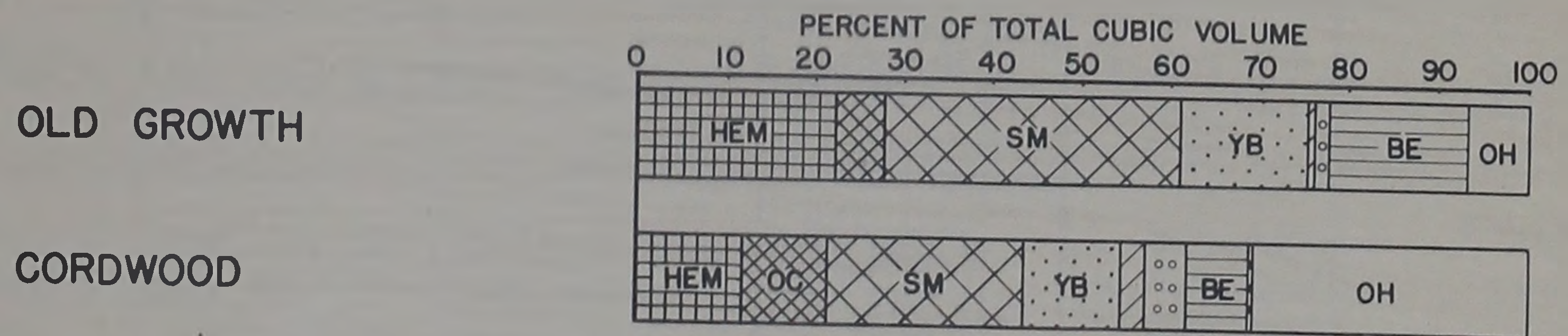
| Forest cover type | Regional average | Minnesota | Wisconsin | Michigan |
|-------------------------|------------------|------------|------------|------------|
| | Board feet | Board feet | Board feet | Board feet |
| White pine..... | 10,083 | 11,254 | 9,877 | 7,946 |
| Red pine..... | 10,972 | 14,559 | 5,080 | 4,285 |
| Jack pine..... | 7,309 | 10,423 | 3,570 | ..... |
| Spruce-fir..... | 6,582 | 8,627 | 3,887 | 5,745 |
| Spruce swamp..... | 6,643 | ..... | ..... | 6,643 |
| Tamarack swamp..... | 4,403 | ..... | 4,403 | ..... |
| Cedar swamp..... | 3,175 | 3,535 | 4,180 | 2,929 |
| Northern hardwoods..... | 9,950 | 5,178 | 8,416 | 10,942 |
| Oak..... | 5,089 | 3,184 | 4,949 | 6,478 |
| Ash-elm..... | 5,583 | 4,731 | 5,294 | 6,151 |
| Aspen-birch..... | 6,086 | 6,138 | 5,521 | 6,495 |
| Scrub forest..... | 659 | ..... | 659 | ..... |
| All forest types..... | 8,985 | 7,924 | 7,248 | 10,250 |

^{1/} By International 1/4"-kerf rule.

COMPARATIVE COMPOSITION BY SPECIES OF OLD GROWTH STANDS OF NORTHERN HARDWOODS IN SEVERAL ECONOMIC UNITS



COMPARATIVE COMPOSITION BY SPECIES OF OLD GROWTH AND CORDWOOD STANDS OF NORTHERN HARDWOODS IN MICHIGAN AND WISCONSIN UNIT 1 MICHIGAN



UNIT 2 WISCONSIN

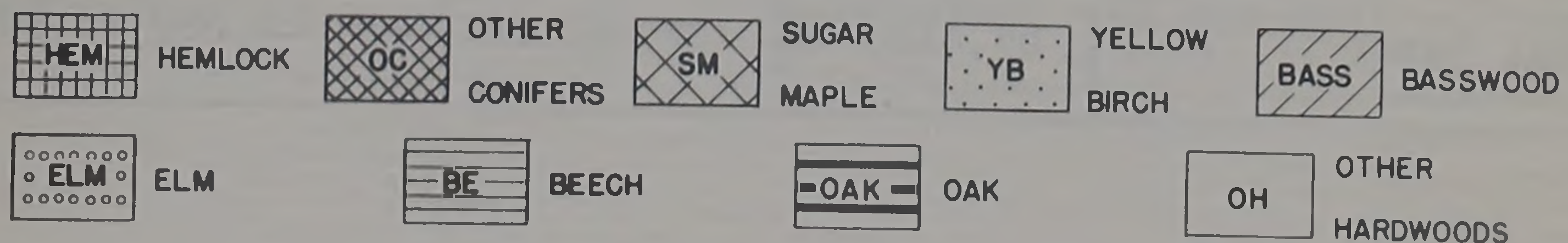
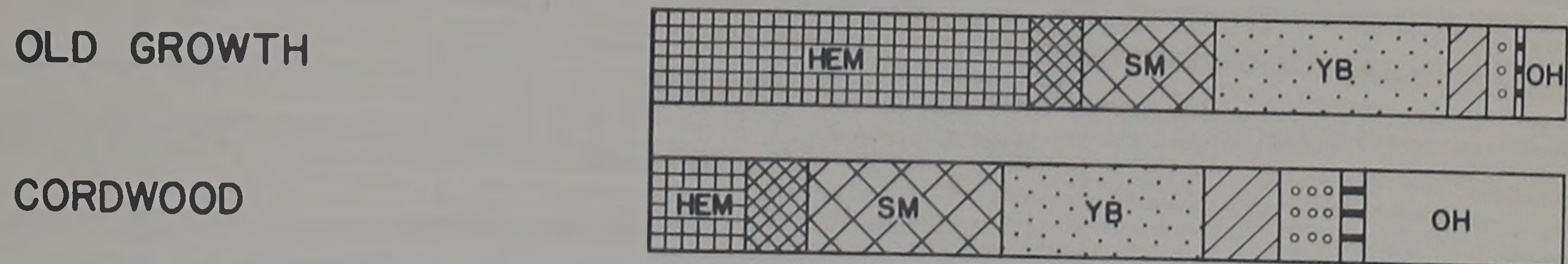


Figure 8

Table 37. -- Volume of all species in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | High-grade pulpwood | Total volume | |
|-------------------------|-------------------|---------------------|--------------|-----------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | | | | |
| 1..... | 1,052,210 | 2,199,000 | 10,520,599 | 775,590 |
| 2..... | 2,941,560 | 3,773,000 | 21,869,534 | 1,611,190 |
| 3..... | 2,347,130 | 4,131,000 | 17,709,133 | 1,323,570 |
| 4..... | 4,008,030 | 7,143,000 | 23,497,135 | 1,789,570 |
| 5..... | 1,525,920 | 300,000 | 12,586,199 | 939,120 |
| 6..... | 579,890 | 694,000 | 6,314,933 | 464,370 |
| Total..... | 12,454,740 | 18,240,000 | 92,497,533 | 6,903,410 |
| Wisconsin | | | | |
| 1..... | 5,589,000 | 1,955,000 | 29,772,331 | 2,211,000 |
| 2..... | 3,683,000 | 2,652,000 | 25,298,668 | 1,871,000 |
| 3..... | 4,429,000 | 1,207,000 | 28,624,999 | 2,141,000 |
| 4..... | 2,911,000 | 269,000 | 18,689,333 | 1,401,000 |
| Total..... | 16,612,000 | 6,083,000 | 102,385,331 | 7,624,000 |
| Michigan | | | | |
| 1..... | 7,724,000 | 5,315,000 | 41,262,667 | 3,088,000 |
| 2..... | 15,559,000 | 5,472,000 | 71,412,999 | 5,337,000 |
| 3..... | 2,320,000 | 3,980,000 | 22,100,667 | 1,647,000 |
| 4..... | 2,946,000 | 350,000 | 16,153,333 | 1,210,000 |
| Total..... | 28,549,000 | 15,117,000 | 150,929,666 | 11,282,000 |
| Regional total..... | 57,615,740 | 39,440,000 | 345,812,530 | 25,809,410 |

Table 38. -- Volume of white pine in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|----------------------------|-------------------|-------------------|-----------------|
| | | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | <u>M ft. b.m.</u> | | |
| 1..... | 69,870 | 280,133 | 21,010 |
| 2..... | 468,090 | 1,291,333 | 96,850 |
| 3..... | 568,370 | 1,516,667 | 113,750 |
| 4..... | 463,690 | 1,495,734 | 112,180 |
| 5..... | 13,450 | 60,533 | 4,540 |
| 6..... | 14,730 | 51,200 | 3,840 |
| Total..... | 1,598,200 | 4,695,600 | 352,170 |
| Wisconsin | | | |
| 1..... | 593,000 | 1,973,333 | 148,000 |
| 2..... | 199,000 | 840,000 | 63,000 |
| 3..... | 330,000 | 1,226,667 | 92,000 |
| 4..... | 23,000 | 93,333 | 7,000 |
| Total..... | 1,145,000 | 4,133,333 | 310,000 |
| Michigan | | | |
| 1..... | 269,000 | 986,667 | 74,000 |
| 2..... | 545,000 | 1,666,666 | 125,000 |
| 3..... | 150,000 | 680,000 | 51,000 |
| 4..... | 46,000 | 226,667 | 17,000 |
| Total..... | 1,010,000 | 3,560,000 | 267,000 |
| Regional total..... | 3,753,200 | 12,388,933 | 929,170 |

Table 39. -- Volume of red pine in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|----------------------------|-------------------|--------------|------------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>M cu. ft.</u> |
| Minnesota | | | |
| 1..... | 34,660 | 202,400 | 15,180 |
| 2..... | 450,160 | 1,483,467 | 111,260 |
| 3..... | 293,010 | 766,800 | 57,510 |
| 4..... | 208,970 | 584,667 | 43,850 |
| 5..... | 7,520 | 26,800 | 2,010 |
| 6..... | 4,060 | 20,133 | 1,510 |
| Total..... | 998,380 | 3,084,267 | 231,320 |
| Wisconsin | | | |
| 1..... | 166,000 | 653,333 | 49,000 |
| 2..... | 86,000 | 386,667 | 29,000 |
| 3..... | 35,000 | 133,333 | 10,000 |
| 4..... | 6,000 | 26,667 | 2,000 |
| Total..... | 293,000 | 1,200,000 | 90,000 |
| Michigan | | | |
| 1..... | 46,000 | 320,000 | 24,000 |
| 2..... | 37,000 | 120,000 | 9,000 |
| 3..... | 103,000 | 493,333 | 37,000 |
| 4..... | 1,000 | ..... | ..... |
| Total..... | 187,000 | 933,333 | 70,000 |
| Regional total..... | 1,478,380 | 5,217,600 | 391,320 |

Table 40. -- Volume of jack pine in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | High-grade pulpwood | Total volume | |
|----------------------------|------------------|------------------------|-------------------|------------------|
| | M ft. b.m. | Cords | Cords | M cu.ft. |
| Minnesota | | | | |
| 1..... | 144,380 | 547,000 | 1,256,000 | 94,340 |
| 2..... | 412,510 | 1,142,000 | 3,276,000 | 243,570 |
| 3..... | 106,720 | 440,000 | 926,000 | 69,950 |
| 4..... | 1,590,920 | 3,259,000 | 8,057,000 | 622,830 |
| 5..... | 5,460 | 2,000 | 23,000 | 1,750 |
| 6..... | 2,800 | 10,000 | 27,000 | 1,990 |
| Total..... | 2,262,790 | 5,400,000 | 13,565,000 | 1,034,430 |
| Wisconsin | | | | |
| 1..... | 53,000 | 249,000 | 443,000 | 33,000 |
| 2..... | 101,000 | 627,000 | 1,041,000 | 77,000 |
| 3..... | 87,000 | 496,000 | 865,000 | 67,000 |
| 4..... | 5,000 | 31,000 | 57,000 | 4,000 |
| Total..... | 246,000 | 1,403,000 | 2,406,000 | 181,000 |
| Michigan | | | | |
| 1..... | 29,000 | 293,000 | 458,000 | 34,000 |
| 2..... | 28,000 | 74,000 | 157,000 | 12,000 |
| 3..... | 112,000 | 854,000 | 1,360,000 | 102,000 |
| 4..... | ..... | 14,000 | 14,000 | 1,000 |
| Total..... | 169,000 | 1,235,000 | 1,989,000 | 149,000 |
| Regional total..... | 2,677,790 | 8,038,000 | 17,960,000 | 1,364,430 |

Table 41. -- Volume of hemlock in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | High-grade pulpwood | Total volume | |
|----------------------------|------------|------------------------|--------------|-----------|
| | M ft. b.m. | Cords | Cords | M cu.ft. |
| Minnesota | | | | |
| 1..... | ..... | ..... | ..... | ..... |
| 2..... | ..... | ..... | ..... | ..... |
| 3..... | ..... | ..... | ..... | ..... |
| 4..... | ..... | ..... | ..... | ..... |
| 5..... | ..... | ..... | ..... | ..... |
| 6..... | ..... | ..... | ..... | ..... |
| Total..... | ..... | ..... | ..... | ..... |
| Wisconsin | | | | |
| 1..... | 1,406,000 | 529,000 | 5,326,000 | 394,000 |
| 2..... | 1,064,000 | 458,000 | 4,161,000 | 308,000 |
| 3..... | 202,000 | 105,000 | 871,000 | 64,000 |
| 4..... | ..... | ..... | ..... | ..... |
| Total..... | 2,672,000 | 1,092,000 | 10,358,000 | 766,000 |
| Michigan | | | | |
| 1..... | 1,529,000 | 841,000 | 5,693,000 | 422,000 |
| 2..... | 4,831,000 | 1,396,000 | 16,824,000 | 1,242,000 |
| 3..... | 186,000 | 198,000 | 885,000 | 66,000 |
| 4..... | 4,000 | 3,000 | 14,000 | 1,000 |
| Total..... | 6,550,000 | 2,438,000 | 23,416,000 | 1,731,000 |
| Regional total..... | 9,222,000 | 3,530,000 | 33,774,000 | 2,497,000 |

Table 42. -- Volume of spruce in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | High-grade pulpwood | Total volume | |
|----------------------------|------------|------------------------|--------------|-----------|
| | M ft. b.m. | Cords | Cords | M cu.ft. |
| Minnesota | | | | |
| 1..... | 100,800 | 305,000 | 1,094,000 | 79,670 |
| 2..... | 199,780 | 398,000 | 1,165,000 | 89,070 |
| 3..... | 416,280 | 1,911,000 | 3,710,000 | 283,830 |
| 4..... | 503,450 | 2,653,000 | 4,020,000 | 316,730 |
| 5..... | 720 | 17,000 | 38,000 | 2,740 |
| 6..... | 19,700 | 145,000 | 265,000 | 20,000 |
| Total..... | 1,240,730 | 5,429,000 | 10,292,000 | 792,040 |
| Wisconsin | | | | |
| 1..... | 42,000 | 289,000 | 444,000 | 32,000 |
| 2..... | 83,000 | 274,000 | 515,000 | 40,000 |
| 3..... | 13,000 | 48,000 | 86,000 | 6,000 |
| 4..... | ..... | ..... | ..... | ..... |
| Total..... | 138,000 | 611,000 | 1,045,000 | 78,000 |
| Michigan | | | | |
| m 1..... | 267,000 | 1,153,000 | 2,005,000 | 154,000 |
| 2..... | 694,000 | 1,429,000 | 3,039,000 | 242,000 |
| 3..... | 23,000 | 188,000 | 246,000 | 19,000 |
| 4..... | ..... | 1,000 | 1,000 | ..... |
| Total..... | 984,000 | 2,771,000 | 5,291,000 | 415,000 |
| Regional total..... | 2,362,730 | 8,811,000 | 16,628,000 | 1,285,040 |

Table 43. -- Volume of balsam fir in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | High-grade pulpwood | Total volume | |
|----------------------------|------------------|---------------------|-------------------|------------------|
| | M ft. b.m. | Cords | Cords | M cu.ft. |
| Minnesota | | | | |
| 1..... | 41,330 | 751,000 | 1,194,000 | 89,650 |
| 2..... | 116,780 | 572,000 | 1,556,000 | 114,100 |
| 3..... | 121,130 | 695,000 | 1,647,000 | 121,810 |
| 4..... | 61,640 | 484,000 | 629,000 | 49,850 |
| 5..... | 5,150 | 22,000 | 47,000 | 3,540 |
| 6..... | 4,280 | 27,000 | 61,000 | 4,540 |
| Total..... | 350,310 | 2,551,000 | 5,134,000 | 383,490 |
| Wisconsin | | | | |
| 1..... | 40,000 | 357,000 | 765,000 | 56,000 |
| 2..... | 82,000 | 507,000 | 1,149,000 | 86,000 |
| 3..... | 11,000 | 92,000 | 194,000 | 15,000 |
| 4..... | ..... | ..... | ..... | ..... |
| Total..... | 133,000 | 956,000 | 2,108,000 | 157,000 |
| Michigan | | | | |
| 1..... | 272,000 | 1,641,000 | 2,637,000 | 200,000 |
| 2..... | 298,000 | 1,924,000 | 3,003,000 | 228,000 |
| 3..... | 36,000 | 362,000 | 486,000 | 37,000 |
| 4..... | ..... | 1,000 | 1,000 | ..... |
| Total..... | 606,000 | 3,928,000 | 6,127,000 | 465,000 |
| Regional total..... | 1,089,310 | 7,435,000 | 13,369,000 | 1,005,490 |

Table 44. -- Volume of tamarack in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | High-grade pulpwood | Total volume | |
|----------------------------|------------|------------------------|--------------|----------|
| | M ft. b.m. | Cords | Cords | M cu.ft. |
| Minnesota | | | | |
| 1..... | 2,930 | 4,000 | 134,000 | 9,050 |
| 2..... | 33,140 | 96,000 | 423,000 | 30,340 |
| 3..... | 77,460 | 436,000 | 781,000 | 59,820 |
| 4..... | 760 | 9,000 | 13,000 | 960 |
| 5..... | 16,280 | 62,000 | 220,000 | 15,910 |
| 6..... | 6,770 | 37,000 | 68,000 | 5,150 |
| Total..... | 137,340 | 644,000 | 1,639,000 | 121,230 |
| Wisconsin | | | | |
| 1..... | 17,000 | 103,000 | 156,000 | 12,000 |
| 2..... | 10,000 | 87,000 | 122,000 | 8,000 |
| 3..... | 55,000 | 222,000 | 370,000 | 29,000 |
| 4..... | ..... | ..... | ..... | ..... |
| Total..... | 82,000 | 412,000 | 648,000 | 49,000 |
| Michigan | | | | |
| 1..... | 39,000 | 295,000 | 420,000 | 32,000 |
| 2..... | 19,000 | 64,000 | 129,000 | 10,000 |
| 3..... | 15,000 | 87,000 | 132,000 | 10,000 |
| 4..... | 5,000 | 62,000 | 111,000 | 8,000 |
| Total..... | 78,000 | 508,000 | 792,000 | 60,000 |
| Regional total..... | 297,340 | 1,564,000 | 3,079,000 | 230,230 |

Table 45. -- Volume of cedar in the Lake States Region, by State and economic unit

| State and economic unit | Total volume | | Poles | Posts | | Tops and other material |
|-------------------------|--------------|------------|----------|----------|----------|-----------------------------|
| | | | | Round | Split | |
| | M cu. ft. | Cords | M pieces | M pieces | M pieces | M ^{cu. ft.} pieces |
| Minnesota | | | | | | |
| 1..... | 54,580 | 727,733 | 1,820 | 10,109 | 3,138 | 15,580 |
| 2..... | 51,810 | 690,800 | 1,633 | 10,780 | 2,419 | 19,810 |
| 3..... | 170,590 | 2,274,534 | 5,214 | 33,397 | 8,702 | 60,590 |
| 4..... | 47,810 | 637,467 | 2,037 | 5,113 | 532 | 14,980 |
| 5..... | 40 | 533 | 4 | 54 | 3 | 40 |
| 6..... | 11,920 | 158,933 | 351 | 2,500 | 524 | 6,920 |
| Total..... | 336,750 | 4,490,000 | 11,059 | 61,953 | 15,318 | 117,920 |
| Wisconsin | | | | | | |
| 1..... | 109,000 | 1,453,333 | 3,348 | 21,548 | 12,059 | 24,000 |
| 2..... | 92,000 | 1,226,667 | 3,272 | 16,978 | 10,889 | 17,000 |
| 3..... | 39,000 | 520,000 | 954 | 10,541 | 2,982 | 11,000 |
| 4..... | <u>1/</u> | ..... | 15 | 107 | 29 | <u>1/</u> |
| Total..... | 240,000 | 3,200,000 | 7,589 | 49,174 | 25,959 | 52,000 |
| Michigan | | | | | | |
| 1..... | 313,000 | 4,173,333 | 9,661 | 59,627 | 35,177 | 66,000 |
| 2..... | 297,000 | 3,960,000 | 11,208 | 31,698 | 17,634 | 81,000 |
| 3..... | 77,000 | 1,026,667 | 1,939 | 21,215 | 5,579 | 27,000 |
| 4..... | 4,000 | 53,333 | 62 | 1,107 | 48 | 3,000 |
| Total..... | 691,000 | 9,213,333 | 22,870 | 113,647 | 58,438 | 177,000 |
| Regional total. | 1,267,750 | 16,903,333 | 41,518 | 224,774 | 99,715 | 346,920 |

1/ Less than 1 million cubic feet.

Table 46. -- Volume of sugar maple in the Lake States Region, by State
AND economic unit

| State and economic unit | Saw timber | Total volume | |
|----------------------------|-------------------|--------------|-----------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | | | |
| 1..... | 30,440 | 188,267 | 14,120 |
| 2..... | 56,060 | 364,533 | 27,340 |
| 3..... | 70 | 2,400 | 180 |
| 4..... | <u>1/</u> | <u>1/</u> | <u>1/</u> |
| 5..... | 172,900 | 837,066 | 62,780 |
| 6..... | 46,650 | 226,267 | 16,970 |
| Total..... | 306,120 | 1,618,533 | 121,390 |
| Wisconsin | | | |
| 1..... | 1,324,000 | 5,666,666 | 425,000 |
| 2..... | 452,000 | 2,546,667 | 191,000 |
| 3..... | 779,000 | 3,573,333 | 268,000 |
| 4..... | 254,000 | 1,306,667 | 98,000 |
| Total..... | 2,809,000 | 13,093,333 | 982,000 |
| Michigan | | | |
| 1..... | 2,061,000 | 7,946,667 | 596,000 |
| 2..... | 4,671,000 | 19,746,667 | 1,481,000 |
| 3..... | 427,000 | 2,360,000 | 177,000 |
| 4..... | 264,000 | 1,253,333 | 94,000 |
| Total..... | 7,423,000 | 31,306,667 | 2,348,000 |
| Regional total..... | 10,538,120 | 46,018,533 | 3,451,390 |

1/ Sugar maple in this unit is of inferior quality and is included with soft maple, in table 54.

Table 47. -- Volume of yellow birch in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|----------------------------|-------------------|--------------|-----------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | | | |
| 1..... | 85,580 | 386,933 | 29,020 |
| 2..... | 6,240 | 41,600 | 3,120 |
| 3..... | 340 | 2,800 | 210 |
| 4..... | ..... | ..... | ..... |
| 5..... | 900 | 9,600 | 720 |
| 6..... | 170 | 1,867 | 140 |
| Total..... | 93,230 | 442,800 | 33,210 |
| Wisconsin | | | |
| 1..... | 584,000 | 3,026,667 | 227,000 |
| 2..... | 689,000 | 3,626,667 | 272,000 |
| 3..... | 110,000 | 813,333 | 61,000 |
| 4..... | 5,000 | 40,000 | 3,000 |
| Total..... | 1,388,000 | 7,506,667 | 563,000 |
| Michigan | | | |
| 1..... | 1,046,000 | 4,160,000 | 312,000 |
| 2..... | 2,678,000 | 11,280,000 | 846,000 |
| 3..... | 43,000 | 293,333 | 22,000 |
| 4..... | 4,000 | 80,000 | 6,000 |
| Total..... | 3,771,000 | 15,813,333 | 1,186,000 |
| Regional total..... | 5,252,230 | 23,762,800 | 1,782,210 |

Table 48. -- Volume of basswood in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|----------------------------|-------------------|--------------|-----------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | | | |
| 1..... | 20,080 | 143,867 | 10,790 |
| 2..... | 116,230 | 764,400 | 57,330 |
| 3..... | 10,540 | 48,400 | 3,630 |
| 4..... | ..... | ..... | ..... |
| 5..... | 242,640 | 1,371,866 | 102,890 |
| 6..... | 61,710 | 386,667 | 29,000 |
| Total..... | 451,200 | 2,715,200 | 203,640 |
| Wisconsin | | | |
| 1..... | 278,000 | 1,373,333 | 103,000 |
| 2..... | 127,000 | 880,000 | 66,000 |
| 3..... | 262,000 | 1,533,334 | 115,000 |
| 4..... | 161,000 | 920,000 | 69,000 |
| Total..... | 828,000 | 4,706,667 | 353,000 |
| Michigan | | | |
| 1..... | 66,000 | 293,333 | 22,000 |
| 2..... | 385,000 | 1,573,333 | 118,000 |
| 3..... | 110,000 | 826,667 | 62,000 |
| 4..... | 199,000 | 866,667 | 65,000 |
| Total..... | 760,000 | 3,560,000 | 267,000 |
| Regional total..... | 2,039,200 | 10,981,867 | 823,640 |

Table 49. -- Volume of elm in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|----------------------------|-------------------|--------------|-----------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | | | |
| 1..... | 23,150 | 124,667 | 9,350 |
| 2..... | 127,070 | 719,333 | 53,950 |
| 3..... | 72,230 | 386,000 | 28,950 |
| 4..... | ..... | ..... | ..... |
| 5..... | 321,960 | 1,636,400 | 122,730 |
| 6..... | 157,280 | 902,000 | 67,650 |
| Total..... | 701,690 | 3,768,400 | 282,630 |
| Wisconsin | | | |
| 1..... | 320,000 | 1,706,667 | 128,000 |
| 2..... | 160,000 | 1,000,000 | 75,000 |
| 3..... | 562,000 | 3,106,666 | 233,000 |
| 4..... | 187,000 | 1,106,667 | 83,000 |
| Total..... | 1,229,000 | 6,920,000 | 519,000 |
| Michigan | | | |
| 1..... | 150,000 | 666,667 | 50,000 |
| 2..... | 286,000 | 1,026,666 | 77,000 |
| 3..... | 242,000 | 1,840,000 | 138,000 |
| 4..... | 570,000 | 2,920,000 | 219,000 |
| Total..... | 1,248,000 | 6,453,333 | 484,000 |
| Regional total..... | 3,178,690 | 17,141,733 | 1,285,630 |

Table 50. -- Volume of beech in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|----------------------------|-------------------|--------------|-----------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | | | |
| 1..... | ..... | ..... | ..... |
| 2..... | ..... | ..... | ..... |
| 3..... | ..... | ..... | ..... |
| 4..... | ..... | ..... | ..... |
| 5..... | ..... | ..... | ..... |
| 6..... | ..... | ..... | ..... |
| Total..... | ..... | ..... | ..... |
| Wisconsin | | | |
| 1..... | 129,000 | 666,667 | 50,000 |
| 2..... | ..... | ..... | ..... |
| 3..... | 41,000 | 280,000 | 21,000 |
| 4..... | ..... | ..... | ..... |
| Total..... | 170,000 | 946,667 | 71,000 |
| Michigan | | | |
| 1..... | 948,000 | 3,760,000 | 282,000 |
| 2..... | 17,000 | 80,000 | 6,000 |
| 3..... | 260,000 | 1,160,000 | 87,000 |
| 4..... | 101,000 | 560,000 | 42,000 |
| Total..... | 1,326,000 | 5,560,000 | 417,000 |
| Regional total..... | 1,496,000 | 6,506,667 | 488,000 |

Table 51. -- Volume of oaks in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|-------------------------|-------------------|--------------|-----------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | | | |
| 1..... | 7,440 | 47,333 | 3,550 |
| 2..... | 75,570 | 553,734 | 41,530 |
| 3..... | 2,270 | 8,133 | 610 |
| 4..... | ..... | ..... | ..... |
| 5..... | 495,440 | 3,785,467 | 283,910 |
| 6..... | 181,070 | 1,469,200 | 110,190 |
| Total..... | 761,790 | 5,863,867 | 439,790 |
| Wisconsin | | | |
| 1..... | 135,000 | 653,333 | 49,000 |
| 2..... | 89,000 | 586,667 | 44,000 |
| 3..... | 1,238,000 | 7,600,000 | 570,000 |
| 4..... | 1,863,000 | 11,026,666 | 827,000 |
| Total..... | 3,325,000 | 19,866,666 | 1,490,000 |
| Michigan ^{1/} | | | |
| 1..... | 4,000 | 53,333 | 4,000 |
| 2..... | 58,000 | 306,667 | 23,000 |
| 3..... | 167,000 | 2,946,667 | 221,000 |
| 4..... | 982,000 | 5,173,333 | 388,000 |
| Total..... | 1,211,000 | 8,480,000 | 636,000 |
| Regional total..... | 5,297,790 | 34,210,533 | 2,565,790 |

^{1/} Cubic-foot and cordwood values include volume of scrub trees.

Table 52. -- Volume of aspen in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | High-grade pulpwood | Total volume | |
|----------------------------|------------|------------------------|--------------|-----------|
| | M ft. b.m. | Cords | Cords | M cu.ft. |
| Minnesota | | | | |
| 1..... | 263,070 | 592,000 | 2,929,000 | 209,360 |
| 2..... | 681,180 | 1,565,000 | 7,407,000 | 530,920 |
| 3..... | 534,100 | 649,000 | 3,997,000 | 289,550 |
| 4..... | 773,070 | 738,000 | 4,880,000 | 356,840 |
| 5..... | 77,330 | 197,000 | 1,025,000 | 72,690 |
| 6..... | 37,950 | 475,000 | 1,843,000 | 128,870 |
| Total..... | 2,366,700 | 4,216,000 | 22,081,000 | 1,588,230 |
| Wisconsin | | | | |
| 1..... | 191,000 | 428,000 | 2,665,000 | 186,000 |
| 2..... | 251,000 | 699,000 | 4,244,000 | 297,000 |
| 3..... | 203,000 | 244,000 | 1,799,000 | 127,000 |
| 4..... | 159,000 | 238,000 | 939,000 | 70,000 |
| Total..... | 804,000 | 1,609,000 | 9,647,000 | 680,000 |
| Michigan | | | | |
| 1..... | 384,000 | 1,092,000 | 3,263,000 | 237,000 |
| 2..... | 166,000 | 585,000 | 2,701,000 | 186,000 |
| 3..... | 284,000 | 2,291,000 | 5,205,000 | 379,000 |
| 4..... | 121,000 | 269,000 | 879,000 | 65,000 |
| Total..... | 955,000 | 4,237,000 | 12,048,000 | 867,000 |
| Regional total..... | 4,125,700 | 10,062,000 | 43,776,000 | 3,135,230 |

Table 53. -- Volume of paper birch in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|-------------------------|-------------------|--------------|-----------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | | | |
| 1..... | 168,670 | 1,306,266 | 97,970 |
| 2..... | 125,990 | 1,297,867 | 97,340 |
| 3..... | 113,820 | 1,315,333 | 98,650 |
| 4..... | 353,140 | 3,009,600 | 225,720 |
| 5..... | 13,960 | 282,267 | 21,170 |
| 6..... | 7,760 | 114,533 | 8,590 |
| Total..... | 783,340 | 7,325,866 | 549,440 |
| Wisconsin | | | |
| 1..... | 78,000 | 826,666 | 62,000 |
| 2..... | 43,000 | 560,000 | 42,000 |
| 3..... | 18,000 | 346,667 | 26,000 |
| 4..... | 21,000 | 226,667 | 17,000 |
| Total..... | 160,000 | 1,960,000 | 147,000 |
| Michigan | | | |
| 1..... | 201,000 | 1,600,000 | 120,000 |
| 2..... | 89,000 | 946,667 | 71,000 |
| 3..... | 53,000 | 666,667 | 50,000 |
| 4..... | 2,000 | 53,333 | 4,000 |
| Total..... | 345,000 | 3,266,667 | 245,000 |
| Regional total..... | 1,288,340 | 12,552,533 | 941,440 |

Table 54. -- Volume of soft maple in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|-------------------------|-------------------|--------------|-----------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | | | |
| 1..... | 8,340 | 59,467 | 4,460 |
| 2..... | 3,960 | 55,200 | 4,140 |
| 3..... | 2,410 | 26,133 | 1,960 |
| 4..... | 51,510 | 164,667 | 12,350 |
| 5..... | 35,290 | 238,000 | 17,850 |
| 6..... | 9,130 | 76,933 | 5,770 |
| Total..... | 110,640 | 620,400 | 46,530 |
| Wisconsin | | | |
| 1..... | 116,000 | 893,333 | 67,000 |
| 2..... | 99,000 | 853,333 | 64,000 |
| 3..... | 161,000 | 1,253,333 | 94,000 |
| 4..... | 59,000 | 453,333 | 34,000 |
| Total..... | 435,000 | 3,453,332 | 259,000 |
| Michigan | | | |
| 1..... | 337,000 | 2,146,667 | 161,000 |
| 2..... | 508,000 | 3,173,333 | 238,000 |
| 3..... | 59,000 | 813,333 | 61,000 |
| 4..... | 293,000 | 1,666,667 | 125,000 |
| Total..... | 1,197,000 | 7,800,000 | 585,000 |
| Regional total..... | 1,742,640 | 11,873,732 | 890,530 |

Table 55. -- Volume of Miscellaneous Hardwoods^{1/} in the Lake States Region,
by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|----------------------------|-------------------|--------------|-----------------|
| | <u>M ft. b.m.</u> | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | | | |
| 1..... | 51,470 | 441,200 | 33,090 |
| 2..... | 68,800 | 726,800 | 54,510 |
| 3..... | 28,380 | 296,000 | 22,200 |
| 4..... | 880 | 6,000 | 450 |
| 5..... | 116,920 | 1,008,934 | 75,670 |
| 6..... | 25,830 | 270,133 | 20,260 |
| Total..... | 292,280 | 2,749,067 | 206,180 |
| Wisconsin | | | |
| 1..... | 117,000 | 1,026,667 | 77,000 |
| 2..... | 148,000 | 1,320,000 | 99,000 |
| 3..... | 322,000 | 2,386,666 | 179,000 |
| 4..... | 168,000 | 1,213,333 | 91,000 |
| Total..... | 755,000 | 5,946,666 | 446,000 |
| Michigan | | | |
| 1..... | 76,000 | 680,000 | 51,000 |
| 2..... | 249,000 | 1,680,000 | 126,000 |
| 3..... | 50,000 | 680,000 | 51,000 |
| 4..... | 354,000 | 2,280,000 | 171,000 |
| Total..... | 729,000 | 5,320,000 | 399,000 |
| Regional total..... | 1,776,280 | 14,015,733 | 1,051,180 |

^{1/} Principally black ash, hickory, and hop-hornbeam.

Table 56. -- Volume of scrub trees in the Lake States Region, by State and economic unit

| State and economic unit | Saw timber | Total volume | |
|----------------------------|-------------------|--------------|-----------------|
| | | <u>Cords</u> | <u>M cu.ft.</u> |
| Minnesota | <u>M ft. b.m.</u> | | |
| 1..... | | 5,333 | 400 |
| 2..... | | 53,467 | 4,010 |
| 3..... | | 4,933 | 370 |
| 4..... | | <u>1/</u> | <u>1/</u> |
| 5..... | | 1,975,733 | 148,180 |
| 6..... | | 373,067 | 27,980 |
| Total..... | | 2,412,533 | 180,940 |
| Wisconsin | | | |
| 1..... | | 53,333 | 4,000 |
| 2..... | | 240,000 | 18,000 |
| 3..... | | 1,666,667 | 125,000 |
| 4..... | | 1,280,000 | 96,000 |
| Total..... | | 3,240,000 | 243,000 |
| Michigan ^{2/} | | | |
| 1..... | | | |
| 2..... | | | |
| 3..... | | | |
| 4..... | | | |
| Total..... | | | |
| Regional total..... | | 5,652,533 | 423,940 |

^{1/} All scrub trees in this unit have been considered cull.

^{2/} Volume of scrub trees in Michigan is combined with that of "oaks," in table 51.

DEFINITIONS AND NOTES

Economic Units

Forest Survey data were assembled by "economic units," each of which has more or less distinctive economic features or forest conditions. The boundaries of these units, which are numbered serially in each State, are shown in figure 1.

Volume Classification

Units of Measure

All volume estimates include living trees only. Timber volumes were computed in terms of total tree volume and in terms of various special forest products. Volumes are expressed in board feet, cubic feet, cords or number of pieces. Board-foot volumes are by the International 1/4"-kerf log rule except where otherwise specified. (The International rule closely approximates green lumber tally.) Cords are standard 4'x4'x8' cords of unpeeled wood. Cubic-foot volumes do not include bark.

Saw Timber

Board-foot volume was computed for all trees 9 to 17 inches in diameter at breast height having at least a 10-foot log of good quality or a 16-foot log of poor quality, and for all trees larger than 17 inches having at least one 16-foot log of good quality or two 16-foot logs of poor quality.

Minimum top diameters were 6 inches in softwood species and aspen, 8 inches in hardwoods. For most trees the top diameter was considerably greater than 8 inches, because the limit of merchantability was determined by branches, forks, etc., rather than by diameter. A large proportion of the small-size logs of pulpwood species were estimated as pulpwood rather than sawlogs.

Cedar was estimated in terms of piece products, and hence is not included with saw timber.

Allowance was made for defect, decay, sweep, and other shrinkage, so that the recorded board-foot volumes are the net merchantable volumes.

High-grade Pulpwood

Only species commonly used for pulpwood in the Lake States were included in the pulpwood estimates. These are spruces, balsam fir, jack pine, hemlock, tamarack, and aspen. No wood in trees less than 5 inches in diameter at breast height was consid-

ered merchantable. No good saw timber was classified as pulpwood, although many of the smaller sawlogs of these species are suitable for pulpwood and probably will be so used.

The pulpwood volume included wood in trees below saw-timber size from which at least two 8-foot sticks could be cut and in tops of sawlog trees from which one 8-foot stick could be cut.

In the case of aspen and hemlock, no wood smaller than 5 inches inside bark was estimated as pulpwood. For other species the minimum diameter was 4 inches.

Cedar Products

Cedar was estimated in terms of numbers of poles and posts. The standards for cedar poles conform to the specifications of the Northern White Cedar Association; lengths range from 16 feet to 45 feet, and minimum and maximum top diameters vary with length of pole over the range from 4-1/2 inches to 9 inches.

Cedar posts are 7 feet long, with a minimum top diameter of 4 inches.

The material estimated as split cedar posts included all wood 4 inches and larger in diameter which was unsuitable for either poles or round posts. Some of this volume is usable for dimension stock, shingle stock, ties, and sawed miscellaneous products. A large proportion, however, is usable only for lagging

or other split products.

Cedar trees which could produce at least a 16-foot pole, 2 posts, 14 lineal feet of reasonable straight splitting material, or a tie-cut, were tallied as sound trees. Those too crooked or rotten to meet these qualifications were culled.

Total Cubic Feet

Total cubic-foot volume included all wood, exclusive of bark, which lay between the stump and a top diameter of 4 inches inside bark. In hardwoods, limbwood larger than 4 inches as well as the main stem was included. The cubic volume of cull trees was excluded from the volume estimates, except where explicitly pointed out in the tables.

Tops and Limbs

Tops and limbs included the volume of wood 4 inches or larger in diameter inside bark lying above sawlogs in saw-timber trees. In conifers this class included only topwood in the main stem; in hardwoods, both topwood and limbwood.

A part of the topwood in conifers is suitable for high-grade pulpwood. This fraction was included both in high-grade pulpwood volumes and in volumes of tops and limbs.

Small Trees

Small trees are those which have a diameter at breast height of at least 5.0 inches but are too small to produce a sawlog of minimum size. All 6- and 8-inch trees were grouped under this heading, and all trees 9 to 12 inches in diameter which did not contain a sawlog of minimum size. Pulpwood volume in such trees was included both in pulpwood volumes and in volumes of small trees.

Cull in Sawlog Trees

Cull in sawlog trees included the volume which is deducted in the woods in the form of short sections or logs because of rot, crook, fork, shake, and other defects, and that which has to be deducted in the mill for defects in merchantable logs.

Cull Trees

Cull trees are those which do not contain the minimum merchantable volume specified above in the definitions of saw timber, pulpwood, and piece products, and which, because of rot, can never attain merchantability.

Log Quality

Log quality is expressed in three grades:

No. 1 Logs must be at least 12 feet long and 12 inches in

diameter inside bark at the small end. The following defects are allowed, the variation depending on log diameter: Up to three standard defects or sound bright knots, each with a diameter of not more than 3 inches or its equivalent in damage to the product of the log; up to 20 percent deduction from the gross scale for rot or similar defects. No. 1 logs must saw out 60 percent or more of No. 1 common or better lumber.

No. 2 Logs must generally be at least 10 feet long and 8 inches in diameter inside bark at the small end. They include, however, the better-quality 8-foot logs, 10 or more inches in diameter; but these -- and likewise all longer logs less than 10 inches in diameter -- must be surface clear, straight, and sound. Larger logs are permitted up to three standard defects. No. 2 logs must cut out 75 percent sound lumber, of which 30 percent must be No. 1 common or better.

No. 3 Logs include all logs suitable for ties, timbers, or low-grade lumber. For most species the minimum size requirements are 8-foot length and 8-inch diameter. These logs will generally cut out 50 percent sound.

Area Classification

Forest areas were classified as to the character of the forest cover and condition of the timber stand. All unimproved

lands in the forest region except marshes, open bogs, unsurveyed waters, barrens, rock outcrops, and heaches were considered forest land, whether supporting forest growth or entirely deforested.

Size Classes

Saw Timber. -- Any stand which had 2,000 board feet or more of saw timber per acre was classified as a saw-timber stand. If 50 percent or more of the volume occurred in trees over 15 inches in diameter at breast height, the stand was classified as Old-Growth Saw Timber; if more than 50 percent of the sawlog volume occurred in trees less than 15 inches in diameter at breast height, the stand was rated Second-Growth Saw Timber.

Cordwood. -- A stand containing less than 2,000 board feet of saw timber per acre but having 3 cords or more per acre of trees below sawlog size was classified as a Cordwood stand.

Reproduction. -- If there were less than 3 cords of cordwood trees and less than 2,000 board feet of saw timber per acre, the stand was rated as Reproduction, provided that at least 10 percent of the available growing space was occupied by small trees of commercial species.

Deforested. -- Forest lands which had at some time been timbered but which qualified for none of the condition classes defined above were rated as Deforested.

Forest Cover Types

Stands were classified into forest cover types according to the predominance^{4/} of a key species or group of species. The white pine cover type, for example, includes stands consisting 50 percent or more of this species. "Mixed" cover types, such as spruce-fir and aspen-birch, are characterized by the predominance, collectively, of the group of indicator species. As might be expected, mixed types vary considerably as to proportions of individual species in the several subdivisions of the region. The principal types were defined as follows:

Jack pine, Red pine, and White pine. -- The types in which these species, respectively, predominate.

Northern Hardwoods, or Hemlock-Hardwood. -- This is a "mixed" type in which the principal species are sugar maple, hemlock, yellow birch, basswood, and beech. Associated species which occur in lesser proportions are northern white pine, red oak, balsam fir, hop-hornbeam, elm, and cedar. The type varies in composition from a mixture of all species to almost pure stands of any one of the

^{4/} The term "predominant," as used in these definitions, means composing 50 percent or more of the total volume in cordwood and saw-timber stands or more than 50 percent of the unsuppressed trees in reproduction stands. A stand in which no single species or group of species clearly predominates is classified according to the more valuable species present.

key species. Pure stands of hemlock are considered a variation of this type.

Oak, or Central Hardwoods. -- This is a mixed type characterized by white, red, and bur oaks in association with maple, basswood, and other hardwoods. It is typical of the Central States but is common in the southern portion only of the Lake States.

Scrub forest. -- Stands of any species or group which are of such poor form as to be totally unmerchantable except for fuel wood and to show no promise of becoming merchantable.

Aspen-Birch. -- Aspen and paper birch, either singly or together, make up more than 50 percent of the stand.

Ash-Elm. -- Occurs in shallow swamps, overflow lands, or "second bottoms." The characteristic species of this type are black ash, American elm, and soft maples. Associates in the swamps of the northern part of the Lake States include balsam poplar, yellow birch, green ash, cedar, hemlock, spruce, and occasional other hardwoods. On the alluvial bottoms in the southern part of the region the associated species are black walnut, butternut, willow, hackberry, balsam poplar, river birch, and swamp white oak.

Spruce-Fir. -- This type is typically a mixture of white spruce, balsam fir, northern white cedar, paper birch, aspen, black ash, and sometimes yellow birch, hemlock, or pine. It occurs on cool moist uplands, or along swamp borders.

Spruce Swamp. -- This type is closely confined to acid peat bogs with poor drainage and is thus distinguished from the spruce-fir type, which grows on upland soils. Black spruce occurs in pure stands or mixed with balsam fir, tamarack, and cedar.

Tamarack Swamp. -- This type is very similar to the spruce swamp type in characteristic associates and site, but tamarack predominates.

Cedar Swamp. -- This type occurs on shallow peat having fair drainage. Common associates of the cedar are swamp species including spruce, balsam fir, tamarack, and paper birch; frequent associates include yellow birch, black ash, red maple, and northern white pine. (A mixture of cedar and other conifers on upland sites is classified under the spruce-fir type.)

Nonproductive Swamp. -- Scrubby spruce or tamarack on deep, poorly drained peat, usually less than 5 inches in d.b.h. at 100 years of age. This type does not include deforested but potentially productive peat land.

Species

Although timber volumes are presented separately for most species, some of the less common hardwood species are grouped.

Miscellaneous hardwoods include ash (principally black ash), hickory, hop-hornbeam, willow, butternut, black walnut, black cherry, hackberry, yellow poplar, sycamore, and black locust.

All species of elm have likewise been grouped, and also the several species of oak. Poplar includes aspen, largetooth aspen, balsam poplar, and eastern cottonwood.

Blue beech, pin cherry, witch-hazel, alder, mountain maple, and crab apple, all more or less shrubby in character, have been excluded from the volume estimates.

In the Lake States Region the species designated red pine in this report is commonly known as Norway pine, that designated hop-hornbeam is commonly known as ironwood, and that designated pin cherry is commonly known also as red or fire cherry.

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The following people have participated at one time or another in the technical phases of the Forest Survey in the Lake States Region.

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